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RETROSPECT AND PROSPECT.

In any organization for the community of interest there must be a leading spirit—one who is farsighted enough to see not only the need of the times but the possibilities of the future, one who has sufficient energy and persistence to translate dreams into acts.

From the old world there came one who possessed not only ideals but energy and by idealizing the real he has been able to realize the ideal, at least relatively, in veterinary organization. It is doubtful if Dr. Liautard, as an active participant in the formation of the U. S. Veterinary Medical Association, fully appreciated the chance of its later development into the American Veterinary Medical Association and the possibilities opened up for welding the veterinary profession of this and adjacent countries into a more capable and homogeneous mass.

Five or six decades ago the veterinary material of this country was decidedly raw from an educational standpoint as compared with European standards. The diagnosis was easy to Dr. Liautard's clear vision and as a remedy he organized one, if not the first of the veterinary schools which has survived. Education, then as now, is fundamental to real progress.

Emphasizing the educational ideal, he later established the *American Veterinary Review*, which at the outset was the official organ of the U. S. Veterinary Medical Association. In 1890 an

extra number of the *Review* was printed, devoted exclusively to the proceedings and papers presented at the first meeting of the association held in Chicago. (The twenty-seventh annual meeting of the association.) From the records this appears to be the first separately printed volume of the proceedings. In subsequent years the association, with its growing membership, printed its own proceedings and the official connection of the *Review* became less apparent. From an historical standpoint it, therefore, seems fitting that the association in considering the abandonment of its separate volume of proceedings, which because of its considerable size, was beginning to cost about as much as the annual dues amounted to, and to substitute a Journal for it, that the old relations with the *Review* should be considered and this publication taken over for the use of the association.

Even in the separate volume of the proceedings it was necessary to abridge the transactions of the meetings and this abridgement must, of necessity maintain in the new *Journal*. The essential items must be presented and there must be space for contributions if the periodical is to be a *Journal* in fact as well as name. It will be our aim to strike a happy medium in this respect, to omit no item of importance of the association's affairs, and yet have a sufficient variety of articles of timely interest to appeal to the progressive practitioner, who, after all, is the bulwark of the profession.

The prospect offers promise. The association member in paying his dues contributes not only to the support of the association, but to the uplift of the profession and receives in return a periodical which keeps him informed of its activities. The practitioner who is not a member may acquire information beyond his own narrow sphere and keep in touch with the profession as a whole, and ultimately see that the association needs him and he needs the association to complete and round out his career. As a unit working in mass formation for the betterment of the profession he will find his efforts productive of more fruitful results than anything he can hope to accomplish in his individual isolation.

In transferring the office of publication from New York City to Ithaca, N. Y. in a limited time, many details are involved which unavoidably tend to delay. Time is required for tabulating the proceedings of the meeting and the papers and discussions there presented, and much work is thrown upon the stenographer in a short space of time before the material can be available for the

Journal. From the necessities of the case the first number of the new volume had to be issued by Doctor Ellis, at some inconvenience, from the New York office. There has been unavoidable delay in performing some of the arrangements at the new office of publication and some indulgence must be asked. Our acknowledgements are due Doctor and Mrs. Ellis for the assistance they have rendered in overcoming these delays as much as possible, and endeavoring to make a difficult task easier.

It has not been our desire to inaugurate violent changes as regards the form and appearance of the *Journal.* Some may be desirable, others unavoidable. We prefer a gray cover because that is the academic color for veterinary medicine. Typographical change and re-arrangement of material is more or less necessary under new conditions.

An important function of any veterinary periodical is the educational one of disseminating knowledge of recent facts in practice, therapeutics and general matters pertaining to the profession. A broad-minded practitioner should include in his study the representative journals of his own country, and at least make an effort to get in touch with one of the foreign journals; but for community of interest there must also be due consideration for the ordinary and every day affairs that touch all practitioners.

For the future we ask the co-operation of all members of the profession. Any success worth having must be based on truth, progress and efficiency. With co-operation all prejudice may be overcome. America should have a foremost place in the world-brotherhood of veterinarians.

P. A. F.

SUTURES AND SUTURING*

J. V. LACROIX, Kansas City, Mo.

For the purpose of joining tissues wherein there has been effected solution of continuity, sutures, of some kind have long been employed to procure prompt coaptation of wound margins. The term "suture" is applicable to material employed in the process of joining tissue as well as to the joined structures after coaptation has been effected; consequently, in one sense, there is no great difference in the significance of the terms "sutures" and "suture materials." We shall limit our consideration of suture materials to those commonly employed.

Suture materials are of vegetable, animal and metallic origin. Of vegetable origin, we have linen thread put up for use in various ways, and this constitutes a very strong and durable agent that is particularly serviceable in uniting surface wounds in thick-skinned animals. Linen thread is very effective when empolyed as a ligature for bulky masses of tissue, but it becomes very dense after having been *in situ* for a few hours and is quite prone to cut through tissue encompassed when tension is great. However, it is a very serviceable material for emergency work upon the large animals and does not become absorbed even when buried in the tissues. For the purpose of reenforcing marginal sutures, linen tape is very useful, since because of its shape, it does not readily cause pressure necrosis under tension.

Of animal origin, the materials usually empolyed are gut, kangaroo tendon and silk. Gut is very frequently employed and when not treated in any one of the numerous ways to retard its absorption, will become absorbed in a few hours. The time required for its absorption depends upon the character of the tissues containing it and the size of the suture material. Tissue that is vascular and that tends to keep sutures in a moist state, will absorb sutures earlier than will tissue that is not so well supplied with vessels. When it is desirable to have a gut suture remain in position for several days, it is treated by being chromicized or iodinized or otherwise rendered more dense. Used in the approximation of some sub-surface wound margins, it is very dependable.

* Presented at the meeting of the A. V. M. A. Section on Practice. Oakland, Cal.

Where there exists material retraction of heavy muscular or tendinous structures attending accidental or intentional division of same, heavier suture materials are employed for effecting coaptation of the retracted margins or ends. For this purpose kangaroo tendon or other prepared fibrous animal tissue is used. However, in the use of buried sutures, due regard must be given the vascularity and bulk of tissue sutured and the amount and size of the material employed. Where tissue is vascular and tension is great, necessarily strong sutures are required. Buried gut sutures may be so inserted that because of unequal distribution of tension anemic necrosis caused by pressure is the result. Likewise an excessive amount of suture material will produce a similar effect.

Silk suture material because of its strength and soft texture, constitutes a valuable agent for almost any case where suturing is indicated. For intestinal work or fixation operations where there exists malposition of viscera of small animals, silk is very useful. For the reduction of certain herniæ in the large animals, heavy braided or twisted silk suture material is often employed. Silk sutures may be buried when used for approximation of sub-surface tissue, and the superficial structures can be brought together with a separate suture, and there results little or no disturbance because of the presence of this buried material if sterile.

Metallic suture materials usually employed are silver and copper wire. We shall not here consider steel in any form, nor aluminum or gold plates which are serviceable in bone surgery. For the purpose of approximating margins of cartilage when wounded, metallic sutures are very serviceable; many veterinarians employ wire for the closure of abdominal wounds of small animals in order to insure their being left *in situ* should the subject be inclined to molest the wound. In certain fractures of the jaw in the horse, copper wire may be employed to good advantage; it may be wound arount the base of teeth, thereby immobilizing the affected parts.

In addition to affecting approximation of tissues that have been divided, sutures are useful in many instances in that they are the means of joining the margins of the skin where wounds have been inflicted, and in this manner there is made use of a natural protection for the underlying tissues, which would otherwise need to be protected by means of dressing material of some sort.

To render possible primary union of tissue, perfect apposition of wound margins with complete immobilization of the structures

in the immediate vicinity is essential, and the use of some kind of suture material is necessary. While in some instances it is possible to bring about this result by the use of bandages or other appliances, such measures in veterinary surgery are applicable only in wounds of the extremities.

For the purpose of accomplishing prompt healing of wounds and lessening the amount of granulation, sutures are of service even though perfect coaptation of wound margins is not effected. It is possible to train toward the normal position with sutures tissues that have been divided in such manner that approximation of the divided portion is impossible, and the result of such suturing is very desirable in some instances. An example is the suturing of the divided portions of the extensor carpi-radialis where the distal portion has been detached from adjacent structures and considerably mutilated. In such cases by retaining in a suitable position the lower portion of the tendon for a week or ten days, the tissues are trained in such manner that excessive granulation with resulting unnecessary blemishes is avoided if subjects so affected are given proper after-care.

To make possible primary union of skin and fascia protecting the sub-surface from exposure and thereby obviating danger of exuberant granulation and in some instances suppuration, sutures which approximate the margins of the skin and fascial wounds with reenforcing sutures to prevent pressure necrosis and tearing out of the marginal sutures, constitute a very practical method of treating many wounds. Where fibrous growths are removed from horses' shoulders by means of approximation of the skin and fascia, primary union of same results, and complete recovery in from two to four weeks without exposure of the underlying tissues and without suppuration, is possible. Contrast this with a similar surgical wound that is left exposed to heal by granulation.

Recently the writer removed a fibrous mass from a horse's shoulder, and facilities were not at hand for the execution of a good technic from the standpoint of asepsis. The subject was not confined except with halter and twitch; the hair was clipped from the surgical area and the parts painted with tincture of iodin; a local anesthetic of cocain was used, and the fibrous tissue was removed. An opening for drainage was made, the upper part of which was two inches below the lower commissure of the margins of the wound made for extirpation of the fibrous tissue; and the

larger opening was firmly untied by means of a glover's suture. The cavity was packed with sterile gauze which was left in position for twenty-four hours. After-care consisted in cleansing the drainage wound daily to allow free discharge of wound secretions. The horse was kept on pillar reins for ten days. Primary union of the apposed wound margins occurred in this case, which proves that with ordinary care such results should be the rule and not the exception in general practice.

For the control of hemorrhage by ligating vessels singly or by ligating *en masse,* some kind of suture material is necessary. In diminishing nutrition of the parts involved in degenerative changes such as certain forms of goiter in dogs and in mammary tumors of sows, good results are accomplished by ligating the parts affected *en masse* with a material of linen or silk, whereas in some instances radical surgical removal would fail to bring about the desired effect.

For surgical purposes, suture material is sterilized and kept so while in suitable containers, and when employed by the veterinary surgeon under certain conditions, care and skill are necessary to prevent its contamination. It is a regrettable fact that among veterinarians comparatively little suturing of surgical or traumatic wounds is done in a manner to make possible wound repair with little or no suppuration. With hemostasis and perfect coaptation and almost complete immobilization of surgically clean wound margins with provision for drainage where necessary, primary union of the contacting surfaces is the usual outcome. If tension upon sutures is not too great and where immobilization of wound margins is possible by means of reenforcing sutures of some kind, prompt and complete repair of wounds necessitating little or no after-care, is the result. The extra time and skill required in the execution of such technic is justified when after-care and results are considered.

For sub-surface coaptation of tissue, several rows or tiers of prepared gut when employed as continuous sutures are preferable to other means of suturing. With continuous sutures, a maximum degree of tension distribution is attained, and comparatively little time is consumed in suturing. However, the average veterinarian habitually employs interrupted sutures in many instances where a continuous suture would be preferable. The use of a buried, continuous suture in laparotomies of small animals precludes all pos-

sibility of herina, and where in some instances the buried suture prevents primary union of all of the surface margins, this causes no serious inconvenience to the subject.

There is no better example of the good effects to be derived by the proper employment of sutures or of the improper use of same than the contrast between the time required for complete recovery of a patient operated upon for the removal of a large shoe boil and so treated that primary union of the skin results in one case and healing by granulation takes place in the other.

An exposed granulating surgical wound is an exhibition of unskillful and barbarous methods practiced by veterinarians, who should give some real thought and effort to the improvement of their way of treatment of wounds both surgical and traumatic so that their methods of handling may become more humane and more practical.

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ABSTRACT OF DISCUSSION.

DR. MCNAIR: Personally I have had considerable trouble with suture necrosis in cats and dogs. I have found that I get the best results in kittens from two to three months old. I operate upon the side entirely and while some of my cases healed by first intention, quite often there is a necrosis of the skin at the point of operation. One practitioner friend makes a small opening and coats it over with balsam. I have not tried that but it has impressed me.

DR. CAMPBELL: Dr. Lacroix was associated with me in practice the past summer, but I do not recall his saying anything to me in regard to the necrosis of the skin of cats. He has performed the operation of Caesarean section on seven, I think, and has had healing by first intention. I believe he uses very little suture material and perhaps that has something to do with it. The inner structures are caught up with one continuous suture and the needle passed through just a few times and the whole securely bandaged with gauze. Contrary to my expectation the bandages have not been pulled off and the healing has been very satisfactory.

DR. BLATTENBERG: The subjects we have to deal with—their uncleanly existence, their unwieldy proportions, their unyielding dispositions, all these make it very difficult to bring about first union. The conditions which seem absolutely necessary for bringing about this union is simply cleanliness, asepsis. Hemostasis interferes with union because the capillary oozing does so much

toward retarding union by first intention. A capillary oozing in the walls brings tension. Antiseptics in the wound retard immediate healing to a great extent. Immobilization is necessary because it does not take very much to separate the capillary circulation that should be transmitted. The suturing does its work but hemostasis and lack of immobilization tend to destroy its good effects. It is wonderful what we can bring about if we can effect immobilization.

DR. TYLER: Operating on cats has been the bane of my existence. I have the best success in closing abdominal wounds with a continuous suture; bring it up carefully and as you carry the thread through and ready to come over to another suture, give each one the same tension, as nearly as possible, and leave it in a rather flaccid condition and allow for the swelling; the continuous suture seems to make an even presssure. For a long time in horses, in heavy wounds, large masses and muscular tissues that have been severed, I have used what I am pleased to term the "button suture". I get large bone tape buttons having two large eyes, at department stores. I use a double thread in the needle, bring it through the tissue and put the thread through each eye, bring it back and tie it. The pressure comes on the buttons, which obviates, to a great extent, the rapid cutting through of the suture material. Later on, if I want to approximate the skin, with the hope of getting more rapid, smooth union, I use the uninterrupted sutures. Where large muscular tissues are cut in two, I use the button. It has been very satisfactory with me.

DR. C. W. FISHER: In the line of Dr. Tyler's remarks, I have used in emergency the rubbers which come on the end of the antitoxin syringe. I have found the rubbers very useful and pressure necrosis will not occur nearly so quickly as if the suture material alone was used.

DR. BLATTENBERG: A very good way of bringing about immobility, especially in approximating the edges of a flesh wound, is to apply a layer of cotton and pour collodion over that, then another layer of cotton that reaches farther from the wound and a coating of collodion over that. If the surrounding area is wet and the collodion will not adhere, an application of alcohol soon dries the surface sufficiently so the collodion will stick.

DR. TYLER: As to shoe-boil wounds, I have never been able to suture a horse's elbow in removal of a shoe-boil but that I had

some re-formations of fibrous deposits. In regard to suturing internal wounds, as oophorectomy and the like, I used to think it not necessary to use silk. Now I use nothing else. Cut the organs off, ligate with silk and drop the parts back into the abdominal cavity. I used to think we should use cat-gut, but nature seems to take care of the silk. You need not be afraid to place the silk in the abdominal cavity if it is clean.

DR. PECK: The tension of a suture is just as important as the suture itself. Several laymen spay their own hogs in my town and I have watched them from time to time and have noticed that those who pulled tight sutures have more or less fatal results. I find in many cases a little too much tension on a suture will necessitate interference afterwards. It is better to have too little than too much tension.

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THE VALUE AND METHODS OF TEACHING THE FUNDAMENTAL SUBJECTS IN THE VETERINARY CURRICULUM.*

H. S. MURPHEY, Ames, Ia.

Your essayist in choosing such a formidable subject did not expect to exhaust it but to bring up for discussion and solution some of the things that he believes should be considered in outlining and teaching a course in veterinary medicine at the present time, so that we may be in a better position to cope with the old and new problems. The subjects he would include are based on the assumption that the end in view is the training of men to practise or to do other work in the treatment and control of disease in animals, in other words, the foundation for special surgery, obstetrics, medicine, food inspection and sanitation. Therefore the following subjects are included: physics, chemistry, zoology, botany, anatomy, physiology, bacteriology, parasitology, pathology, clinical diagnosis, including both physical and so-called laboratory diagnosis, which is merely the use of physical, chemical, bacteriologic and pathologic methods, and pharmacology.

* Presented at the meeting of the Faculties and Examining Boards, A. V. M. A., at Oakland, Cal.

The psychologists have demonstrated experimentally and beyond doubt: 1. That the objective method of teaching is the best because the student can learn the most by that method for the time and energy spent. 2. That a given thing can be learned by fewer repetitions if there is some interval between the repetitions than if the repetitions are consecutive.

In view of these facts, our own experience and that of many others, we believe the didactic method of instruction indefensible except in those cases in which the literature is so voluminous and contradictory that the beginner could not pick the grain from the chaff. In such a case the lecture notes should be furnished the student in mimeographed or pamphlet form; as the material can be covered faster than if the student must write as dictated, also many students do not think fast enough to follow a lecturer, whereas they may get the point from careful reading. Then how shall we teach? By the quiz and laboratory methods supplementing both by references to the literature, so that the student may get this information first hand and learn to use the great storehouses of the masters: *constantly, in quizzes and laboratories the instructor must emphasize the most important things by skillful questioning and supplemental statements, keeping in mind the fact that instruction must be judged by what the student learns and not what the instructor knows.*

We are constantly running up against the "bug-bear" of "practical instruction". In foundation subjects it is largely an illusion because details must be mastered before we can generalize and *apply our knowledge*, which seems to be the central idea in so called "practical instruction". I wish to quote from an address given to this association at the Toronto meeting of the A. V. M. A by Prof. Sisson as follows:

"From a practical standpoint, a euphonious statement which often turns out to mean that he has the ability to memorize pretty well the statements found in some text-books." In other cases "practical knowledge" stands for only a vague, indefinite idea of a particular thing. Again "practical anatomy" at Johns Hopkins means gross anatomy.

In addition to pointing out some of the meanings of "practical" allow me to add that I believe that most of the things which we can learn in the fundamental subjects if taught by men who know, appreciate and can teach the problems of veterinary medi-

cine, are of practical use. I also believe that facts, the application of which is not seen today, may be very important tomorrow; for example, a few years ago, but little attention was paid to ductless glands; now we know them to be very important and treat them accordingly, in all branches of medicine; we stumbled along for years without studying the fascial compartments, now we appreciate their importance in surgery and hence pay careful attention to them in anatomy. Some of us go so far as to say that the body is made of fascial compartments which contain other structures. I heard a very prominent physician say in an address that "if we were better scientists we would be better physicians." Did the famous Crile stumble upon the principles of anoci-association? No, he built it up step by step using knowledge gained through the application of physical, chemical, anatomical and physiologic methods.

We cannot agree under the present condition as to the amount of preparation before actual medical subjects are taken up. We believe that at least high school training at the present time is essential, and hope that before long, college training in physics, chemistry, botany, zoology and language shall be required. *We see no reason why we should lag behind the requirements and standards in human medicine, when our problems are as complex and our duty to the public as great.*

If our matriculant has not had a thorough course in the fundamentals of physics then he should have it after becoming a veterinary student.

In chemistry he should be taught enough inorganic and organic chemistry to learn the fundamental principles, the illustrative material being taken from things he will work with later, e. g. water of crystallization may be illustrated by magnesium sulphate, etc., also a thorough course in physiological chemistry is absolutely essential, this should include the digestion experiments and an examination of the normal fluids, both physically and chemically, the student should prepare his own material from the tissues himself. There is neither time nor necessity for thorough courses in the above subjects, from the standpoint of the physicist and chemist. Probably the greatest criticism of the teaching of the above subjects is *that they are not given from a medical view-point,* hence too much time is devoted to irrelevant phases of the subjects and not enough to the essential, usable things.

A general treatise of zoology should come early in the course

and it should include classification, nomenclature and method of study illustrated by laboratory work on one or two species. The same might be said of botany except that it should also include laboratory work on mitosis, absorption with various concentrations, respiration, etc., to illustrate some of the biological laws, which are difficult to learn experimentally on animals.

As I see it our weaknesses in teaching anatomy at the present time may be given as the lack of coordination, teachers not devoting their whole time to anatomy; failure to utilize all of the methods available and lack of illustrative material. Embryology, normal histology and gross anatomy should be in one department as found at the present time in the A-plus medical schools, such as Johns Hopkins, Harvard, and the Minnesota, Wisconsin, and the Iowa State Universities. If I am correctly informed this is true in veterinary schools only at the University of Pennsylvania, while we have at Ames, the gross and microscopic together with the embryology separate and given by the department of zoology. We believe that embryology should come early in the course. The view that embryology is merely a preparation for obstetrics is not based on the facts in the case. We can never understand the descent or failure of descent of the testicle or the position of the gubernaculum testis except through the facts of embryology; the importance of which has been fully emphasized by Prof. W. L. Williams' careful studies and papers.

Let me quote Flexner: "The earliest topics of the curriculum —anatomy, physiology, physiological chemistry—already hark back to a previous scientific discipline. Everyone of them involves already acquired knowledge and manipulative skill. They are laboratory sciences at the second, not the primary, stage. Consider, for example, anatomy, the simplest and the most fundamental of them all. It used to begin and end with dissection of the adult cadaver. It can neither begin nor end there today; for it must provide the basis upon which experimental physiology, pathology and bacteriology may intelligently be built. Mere dissection does not accomplish this. In addition to gross anatomy, the student must make out under the microscope the normal cellular structure of organ, muscle, nerve and blood vessel; he must grasp the whole process of structural development. Histology and embryology are thus essential aspects of anatomical study. No treatment of the subject including these is possible within the time limits of the

modern medical curriculum unless previous training in general biology has equipped the student with the necessary fundamental conceptions, knowledge and technical dexterity."

We cannot learn tumors or much of the recent advance in pathology and experimental medicine, except by reference to embryology.

I confess that I must constantly use embryology to explain many facts in anatomy; for example, why the recurrent laryngeal nerves pass around the aorta and dorso-cervical arteries respectively, thus traversing the cervical region twice instead of going direct to larynx from the vagus in the carotid region. To learn the classification of glands we must understand how they develop. While a course of embryology given from a zoological standpoint is scientific, it should be presented from the medical view-point, especially the part dealing with histogenesis, which is usually left out, also more attention should be given to the placenta in gross dissections, and histologically, as well as actual dissections on various sized embryos, a thing usually left out entirely; the study of the placenta and embryo we have been doing with our comparative dissections.

We recognize six methods of approach in the teaching of anatomy:

1. Didactic
2. Quiz.
3. Specimen demonstration by instructor.
4. Specimen study by student.
5. Dissection.
6. The use of the living horse to amplify the others.

In our work in histology we use methods one to four inclusive and have made a serious attempt to prepare students for their work in physiology, pathology, surgery and medicine by including the following things not usually studied: 1. Histogenesis of the connective tissues and glands; 2. Joints, bursae, vaginal sheaths, a comparative study of morphology of the blood cells, the digestive organs and reproductive organs, the udder in various physiological states and last but not least the hoof and its corium. In fact you see that it is given from a veterinary view-point. This subject has not received its due share of time and effort in the past and even at the present in most schools; our greatest handicaps are lack of text and laboratory guides; our view-point and how we have met some of the problems follow:

Veterinary anatomy both gross and microscopic has to do with the normal structure of domesticated animals, i. e. the things the body is made of, the organs such as bones, joints, muscles, tendons, brain, nerves, stomach, intestines, lungs, heart, blood vessels, etc., following this and a part of it the detail of structure, what it is and how it is put together, kinds of cells and tissues in the body as a whole as well as their arrangement in particular organs. We need the aid of the microscope because we are unable to see the units with the unaided eye. We call the chemist and physicist to our aid cutting and staining the very thin sections so that we may have color contrasts to see the detail of the minute structures. While we are learning the morphology we also learn some of the fundamental things about the chemical constitution, reactions, and function of the different organs. Anatomy is the oldest and of necessity must be the first of the subjects studied in obtaining a medical education. We must learn about the thing itself before we can profitably study its activities, hence we need to know the structure of the organs or systems of organs before we study the normal functions in the detail of physiology. Again we must know the position, size, color and consistency (feel) of the normal organ to recognize the abnormal or pathological organ. *One cannot diagnose or treat either internal or surgical diseases without a constant use and reference to the detailed facts of anatomy.* To illustrate: Any one can lance an abscess, but only the one trained to feel the difference between the normal and abnormal can locate a deep abscess and drain it properly, to avoid injury to important blood vessels, nerves and adjacent fascial compartments. Again the internist uses anatomical facts to explain the entrance of micro-organisms at definite places, and whether held there or disseminated to other locations, e. g. tuberculosis, strangles, etc. While anatomy has the same value academically that any other science has, viewed from the professional standpoint it is not an end of itself but only the means to an end. It is the first or basis of the foundation subjects of medical science. It is almost platitudinous to state that the stability of the professional structure may be measured largely by the mastery of the fundamentals in this foundation. In addition to the facts learned the training and preparation for the following courses are no small part of the absolute benefits of a course in anatomy. These may be summarized as follows:

1. To learn the scheme of medical terminology.

2. To learn to visualize "retinize", i. e. not to see a bone as a bone but a structure with definite markings and parts such as shaft and extremities with depressions and prominences that are smooth or rough, deep or shallow, etc., to learn "to see" and not merely "to look at".
3. To learn "to feel" and transfer such mental impressions to words.
4. To learn expression: the language of anatomy comes as near that of mathematical precision as any one of the sciences.
5. Judgment to separate the essential from the non-essential, i. e. to conquer and remember the detail of one thing to the exclusion of a less important one.
6. The ability to make and retain original observations in the laboratory, to get knowledge from things rather than books.
7. As above noted to train the senses of sight and touch.

We may summarize the general objects of anatomy to be:

a. To obtain the foundation facts of the structure of domestic animals.
b. To train the student so that the subsequent subjects of the curriculum may be more comprehensible, and more easily mastered.
c. To fit the student so that he may follow the future advancements in medicine.

Of the methods outlined below we were the first veterinary school to co-ordinate gross and microscopic anatomy, to use the living horse and prepared specimens consistently, in both class and laboratory work.

1. The use of the living subject in the class room and laboratory. In the latter the students are required to palpate all superficial structures and surgical landmarks and to outline all other structures. In this way the "feel" and relationships are learned on the living horse step by step, with the dissection. None of the scientific detail is lost but intensified, made useful, and extremely practical so that the student learns the structures of the living by studying both the living and dead and is not learning about the dead by the cadaver alone.

2. The emphasis of topography: While we take up our work in the beginning from the systemic plan, relationships are studied at the same time; to illustrate we find an oblique smooth groove

on posterior surface distal third of shaft of femur; at the time we take this up in osteology we learn that this groove lodges the femoral blood vessels. When we study the rhomboideus muscle we first study its origin, insertion, action, structure, then the relationships from without inward: anteriorily the skin superficial fascia, trapezius muscle; posteriorly the latissimus dorsi and scapular cartilage above the scapula proper; deeply the superficial layer of the dorso scapular ligament which appears superficially below the muscle anterior to the scapula, deeply the splenius, complexus and longissimus anteriorly, while posteriorly the serratus anticus and longissimus; the practical application of this may be seen in operations on cases of fistulous withers. In the class room and laboratory, sections cut in various planes are used to aid in getting clearer ideas of topography. In the latter part of the course of anatomy proper lectures on the topography of the important surgical regions are given. We believe it would be advisable to follow up this work with the senior classes in surgery by giving them lectures, quizzes demonstrations, on the topography of the various regions to be operated in the practicums; the living animals, sections, dissected specimens and cadavers should be used.

3. Co-ordination of gross and microscopic anatomy. This is impossible unless given in a single department so that two methods and view-points will not conflict. In our lectures and laboratory work and quizzes in histology, we constantly use gross specimens and see with the naked eye many things which we are studying microscopically; to illustrate we have gross preparations of the spleen, those showing the capsule and trabeculae only and others showing these spaces filled with the pulp. We hold our microscopic sections up to the window and compare with the gross specimen. While in the dissecting room, the spleen is studied grossly in free hand sections and slides reviewed microscopically, using both gross and microscopic notes as an aid. This is done in both the first and second dissections while in the quizzes over the viscera during the second year the gross anatomy is followed by the detail of histology in discussing the structure of the organ.

4. The constant use of prepared specimens in the class room and laboratory (see No. 6 above) to illustrate, students are dissecting the head, they will be furnished frontal, sagittal and horizontal sections of entire head, and sculptured ones of different aged animals to show teeth sinuses infra orbital and lacrymal canals, to

study and sketch at the same time, so they get the detail for example of the sinuses by chiseling them out and the relations both from their own specimen and by a study of the prepared sections, also further we are having a quiz on the nasal cavity. These same sections are used. *Thus our work is objective rather than didactic.*

5. Compressed air ought to be available in the dissecting rooms so that at times fascial compartments, vaginal sheaths, joints capsules and hollow viscera may be distended. The advisability of accurate knowledge of the position and extent of these structures is self evident from a surgical standpoint.

6. The every day use of the view-point that anatomy for professional purposes must prepare for present day demands of training in physiology, pathology, internal medicine and surgery. (Note the applications previously cited.)

Physiology should be taught by both class room and laboratory instruction; if time permits the lectures and quizzes should be supplemented by demonstrations. It seems unnecessary to say that laboratory work should begin with simple experiments, illustrating the fundamental, chemical and physical laws, as seen in the working of the animal body, then following up step by step to the point where complex experiments are used to show the interdependence of the functional activities of different organs, thus preparing the student to appreciate and understand the abnormal activity of individual organs, the result of this increased or decreased activity on other organs, and thus be prepared to analyze the symptom-complex of disease. The action of drugs and disease symptoms are now largely studied by physiologic methods. The student is thus prepared to analyze the charts and tracings now so commonly used in texts. If he does not have this laboratory training he is not able to understand his present or future problems.

The student should be referred to original sources for information in physiology for two reasons, first to get information from original sources and second to learn how we have obtained our knowledge of the animal body at work and to appreciate the experimental method.

We claim no particular originality for, and should hesitate to offer, the following laboratory outline if it were not for the discussion to follow:

1. Action of cilia by the "cork" experiment in the frog.

2. Simple reflexes on the "pithed" frog.
    a. Simple pinching of toe.
    b. Ditto after giving strychnine.
    c. Ditto after cooling.
    d. Spread of reflex by holding toe and applying acid to side.
3. Effect of section and stimulation of vagus on frog.
4. Actual test of the nerve for methods of stimulation.
5. Changes in normal and injured nerve as determined by electrometer.
6. After discharge in nerves.
7. Summation of stimuli.
8. Independent rhythm as shown by the scratch reflex; The same experiment also shows that movements are definite and purposive.
9. Fatigue in endings and synapse.
10. Refractive period.
11. Inco-ordination (cerebellar).
12. Equilibrium (semicircular canals).
13. Window study of rumination in the goat.
14. Effect of operative removal of the following: thyroid, adrenals, pancreas, liver, kidney, etc.
15. Demonstrations of Pavlov's classic, experimental studies of the digestive glands.
16. Osmosis and filtration in vitro, followed by the formation and absorption of lymph and chyle in vivo (see No. 21).
17. A study of muscle to show tonicity, power of contraction, extensibility, fatigue, etc.
18. Study of the circulation to show how the heart works, its controlling mechanism, and how this may be modified by other functions such as respiration, temperature, exercise, etc., or abnormal conditions such as injury.
19. Study of respiration.
20. The factors concerned in secretion such as nerve stimulation, amount of blood present, rate of blood flow. Inhibition through the nervous system or by other means, as shown in the classic experiments on the secretion of saliva, gastric juice, pancreatic juice and urine and sweat.
21. Demonstration of absorption: a—from the gut as shown by the feeding of fats and killing the animal to observe the

lacteals engorged, also by histological studies with Sudan III or other methods.

b—Absorption from tissue spaces as shown by pigment granules.

c—From such cavities as joints, bursae and vaginal sheaths.

It is understood that the foregoing experiments require apparatus and time. The student in doing the actual work must know in a general way what to expect as a result of his experiment; he must keep notes and study his graphic records; then later the instructor goes over the work in class, discussing it and pointing out the significance of the observations. The graphic charts so commonly used at present in all scientific work can be understood only in this way, by learning how they are made and what they mean.

In bacteriology the class and laboratory work should go hand in hand. The conclusions of the class room should be proven in the laboratory; the course should be such that it may be called applied bacteriology, keeping in mind the fact that we are training a veterinarian; allow me to digress at this point to say that the teacher of any subject must not only know the application of his subject but should have had a broad training in that subject and have come in contact with and worked under a master in that subject. Teachers need training as well as students. A professorship in the veterinary schools of this country should mean much more than it does at the present time.

The student should learn general bacteriology, what bacteria are, and how they grow, how to isolate and cultivate them. *No one can really appreciate aseptic precautions who has not mastered the technique of bacteriology.* Along with the physiology of bacteria the principles of immunity would be learned, since the reactions may be said to be interdependent. Along with or following the study of pathogenic organisms a thorough course in experimental serum therapy should be given; if either is to be neglected let it be the former. In practice or food inspection do we have to do with the cultural characteristics of an organism or the reactions it produces? A student ought to prove Koch's postulates at least once in his course. Parasitology should also be taught as far as possible by the laboratory method. More and more we must depend on the use of the microscope to aid in diagnosis. I never saw the mite of sheep scabies until in practice. Then I fell back on the B. A. I.

bulletin to help in the diagnosis made with the aid of a microscope. It was comparatively easy, but suppose I had tried to identify and classify some of the round worms in which only slight anatomical differences are present? I simply could not have done it, because I had had no training.

General and microscopic pathology are probably well taught, but is there enough attention paid to gross pathology, special and surgical or post mortem work? I fear the answer must be no. Again in practice and food inspection the gross pathology and post mortem are the pivots. I would not minimize, the general and microscopic pathology or the morbid physiology. We must know them to understand disease and the symptoms of disease, also the microscopic lesions. But post mortems should be held in a careful and thorough manner. The student if he ever learns the technique of and how to interpret a post mortem must learn it by doing it under supervision. Also, it must be done often enough so that the method will become a habit; further, if he learns pathology he must study at the same time and co-ordinate the gross and microscopic lesions with the morbid physiology. The evolution of pathological lesions such as hepatization of the lungs, a caseated tubercle, etc., is an indispensable part of the instruction in pathology. A large specimen collection is a very valuable aid that should be available.

We all recognize that the final test of efficiency in medicine is the diagnosis. The clinical diagnosis has two heads: The one physical diagnosis in which we use the senses unaided. The other, the laboratory diagnosis, requires the aid of physical, chemical, physiologic, bacteriologic and pathological methods. *Here again the last analysis depends on the senses. We know that our senses become acute and expert only by use,* so that we may know that knowledge of pertinent facts, training in the use of these facts by certain orderly methods, and judgment in the interpretation of these facts, makes the diagnostician. If field experience alone made a diagnostician then we would have to take off our hats to the gray-haired quack with fifty years "experience in the business."

A few years ago a certain co-operative dairy association hired a manager and sent him to the city to contract their cream for a year. The manager was met by the buyer with this statement: "I have bought cream for 50 years". "What per cent cream do you want?" was asked by the manager. Answer, "100 per cent". Then the manager explained per cent in cream and submitted quo-

tations of various per cents. *The buyer chose the lowest per cent and paid one dollar a gallon for the milk added to the higher per cent of cream quoted.* This young man's training certainly counted more than the old fellow's experience.

Physical examination can only be learned by actually doing it. The method should be thoroughly learned before clinical work is begun and in the clinical work the method followed rigidly. *Slipshod methods of examination are probably more to blame for wrong diagnosis than lack of knowledge of the symptoms.*

Practice in examination of the blood, urine, feces, wound secretions and tumors from actual clinical cases should form a part of the clinical instruction. The student is supposed to know about these things from his previous studies. Now he should have training in actually examining and diagnosing his cases from these things.

General surgery and surgical diagnosis are really a combination of the former principles of bacteriology, pathology and diagnosis combined for the purpose of bringing sharply to the attention of the student and co-ordinating previous facts learned.

In pharmacology the student must learn the general principles of drug action, incompatibilities, advisable combinations, specific action and indications. Again the laboratory method is far superior. Physiologic apparatus should be used here to accurately measure the effects of drugs as well as direct observation on experimental animals.

I do not remember much of the didactic work I had on drugs, but I do remember vividly the action on subjects of strychnine, barium chloride, aconite, digitalis and a number of other drugs.

Probably in no other course given to veterinary students are we more at variance. Hobbies are rode threadbare only to be replaced by other useless ones ad infinitum.

In the course in laboratory pharmacy students should compound usable drugs, and become familiar with pharmaceutical technique.

In materia medica we should not give so much but give it better. A few standard drugs well used will be better than a pharmocopoeia undigested. It is not what we eat but what we digest and assimilate that counts.

I believe that therapeutics should represent a classification and the indications of drugs. Therapeutic measures should be given in

practice and surgery else the student will be burdened with useless material in duplication and conflict.

Sanitary science and governmental control work is not given a special heading as it may well be given with bacteriology and medicine. Likewise shoeing and soundness are classed with surgery.

SUMMARY AND CONCLUSIONS

1. The fundamental subjects should be taught from a veterinary standpoint.

2. The objective method is the best.

3. We must master the fundamental principles by learning the detail of the subjects covered.

4. The instructor's knowledge of a subject does not compensate for the students lack of it.

5. It is impossible to properly teach special surgery, medicine, etc., to students who do not know the fundamental facts and principles of the foundation subjects.

6. We err from a lack of knowledge rather than too much.

7. Our courses should be outlined and taught as given above if we are to keep pace with progress and get the public recognition due the profession.

8. There is a chance for needed improvements in all of our colleges in at least a part of the fundamentals. In other words our work should be readjusted so that all of the work may be balanced, each subject receiving its just share of time and material. Our courses are lopsided and no wheel is stronger than the weakest spoke. One particular line of work should not be developed at the expense of the others, neither can we dismiss a subject by saying that it is not practical, the burden of proof must rest with us.

9. More time and money must be spent in training the student than at present.

10 We must avail ourselves of the increased knowledge from all sources and present our special subject accordingly.

11. A summary of the years progress in each line should be presented for our uses in other lines. This offers a virgin field for English Journals.

12. Instructors must have a broad vision. They must be students and like Lincoln "count that day lost in which they have not learnel some new thing."

When they get the idea and assume the attitude that they

know all that is useful in a subject, they cease to be useful instructors. The learner, the inquisitive genius is the best teacher. *He must radiate enthusiasm, and require something of his students else his instruction is a failure.*

—o—

HOG CHOLERA CONTROL

C. H. STANGE, Ames, Iowa.

A recent article appearing in the *Review* cannot pass without comment as it tends to convey a wrong impression in regard to conditions, especially so far as Iowa is concerned.

The situation instead of being "certainly serious" and our farms being "under stocked", is exactly the opposite. Perhaps the article was intended to apply to Minnesota, but as this is not stated and reference is made to the report from the State Biological Laboratory of Iowa, the writer wishes to state correctly the conditions in Iowa.

The "State-wide Campaign of Public Education" was started here three years ago and is now a common, every day feature in our work. Following is an extract from page 41 of the report referred to: "The educational work which has been of great value in the hog cholera work in this state was carried on by four veterinarians. The farmers have been informed concerning the significance of hog cholera, how it may be recognized, prevented, controlled and how the serum should be and should not be applied." "The total number of people present at lectures and demonstrations was 20,379."

No plan is being offered as a possible solution. Too many have already been offered as theories but Iowa is interested in those that have been thoroughly tried out. A plan has been followed in this state for two and a half years, and it is only after having followed it for that length of time in a state having at present about ten million hogs that I venture to say something concerning the results.

In 1913 or the year the work (outside of educational) on hog cholera was started in Iowa, a census showed a loss of 2,709,876 head of hogs worth approximately $27,098,760, which is considerably more than all of the hogs Minnesota is reported as having. During 1914 reports in this office show that over 70,000,000 cubic

centimeters of serum were used on Iowa farms and about 85%–90% of it was used in connection with virus (simultaneous) and we have not asked others to carry the "weight of responsibility." The result was that the losses during 1914 were reduced from twenty-seven to about six millions of dollars. It would seem according to a number who are still debating what to do while the economic losses in their states remain about the same, that as a result of the distribution of about 1,750 quarts of virus (according to Dr. Reynolds' estimate) during 1914 that this year would experience an enormous increase in the prevalence of the disease. As a matter of fact there is a large decrease and the state has more hogs than it has had for several years, and only isolated outbreaks of cholera are reported,—a rather satisfactory condition even though, "the thing has been simply running wild."

The plan which has been followed in Iowa will probably prevail until some other system which has been tried and been shown to give better results under existing conditions is developed, in brief, is as follows: A State Biological Laboratory was established with a director. A standard of potency for hog cholera serum to be used in the state was established. Before the distribution or sale of serum in the state can be started, the distributor must file a bond of $1,000 as a guarantee that his product will meet the standard of potency and secure a permit which may be revoked for cause. No person is permitted to use virus without receiving satisfactory special instructions and a permit. No distributor is permitted to deliver virus to others than permit holders. Virus permits may be cancelled for cause. Any serum or virus in the state deemed unsafe may be destroyed. The state now maintains such inspection as it deems desirable in serum plants and distributing agencies. All shipments of serum and virus and their destination must be reported.

Outbreaks of cholera in serum alone treated herds are many times more numerous and much more objectionable than "vaccination cholera." In some states where virus distribution is prohibited in sealed bottles under regulation the unstoppered bottle (sick hog) is conveyed along the highway and placed in the herd to insure exposure and permanent immunity.

The problem facing Iowa was to prevent a great economic loss each year. This problem required action and not words, it necessitated a fair estimate of what the farmer will and will not do,

what facilities were available and could be used. Hogs were dying to the value of over half a million dollars a week. Sanitation and newspaper advice had been available for a great many years. The serum (and virus) treatment was new to most farmers. Instead of pinning faith to one method we brought into activity every factor that could be used to advantage under the circumstances. The following figures are sufficient to indicate whether Iowa is succeeding under the present system:

	Per cent*	Jan. 1, 1915 Number of Hogs	Jan. 1, 1914 Number of Hogs
Iowa	125%	8,720,000	6,976,000
Minnesota	120%	1,716,000	1,430,000
Missouri	100%	4,250,000	4,250,000

	Value of Hogs Jan. 1, 1915.	Jan. 1, 1914
Iowa	$95,920,000	$87,898,000
Minnesota	21,450,000	20,020,000
Missouri	34,425,000	36,125,000

The sanitary measures recommended by many are to be commended but *this alone will never prevent the great losses which Iowa experienced before serum came into general use.* "A more comprehensive plan is needed," because while such a plan of thorough disinfection and cleaning up may be theoretically ideal, it does not consider the farmers who will not work in with the plan and who can easily bring to naught the good work done on other farms. Indiscriminate simultaneous vaccination is not recommended and is not practiced generally in this state regardless of whether the the herd is sick or exposed. This is shown by the light demand for serum and virus this year. On the other hand, we think the greatest care should be used in the distribution and use of virus as it may easily become the means of establishing sources of infection. The great difficulty has been that too many have not differentiated between the prevention of great losses and hog cholera eradication. One is a problem at the time of extensive prevalence, the other when the number of outbreaks are at their lowest.

Some of the statements contained in the Minnesota plan are difficult to understand, viz., "the fundamental difficulty is not a too free distribution of hog cholera virus; is not a lack of permits

* As compared with January, 1914. Up to this time, 1915 has shown a great decrease over 1914 in number of outbreaks.

or too many permits for the use of virus. There has been a large and unnecessary spread of hog cholera virus, both natural virus and serum plant virus." "More than one veterinary sanitarian has expressed the wish that the serum-virus treatment has never been developed. In most states where virus has been used at all the thing has been running simply wild." "It seems to have been settled that given a successful official control, serum-virus is a proper procedure for healthy herds in infected territory, etc."

"Serum would be shipped express C. O. D. to the owner, bill covering both serum and administration. Virus would go to the veterinarian who is to administer the treatment." "A veterinarian doing work under this plan would have no money transactions with the owner." "In connection with this plan we would provide for local storage of serum in each infected county."

"There must be assurance of fair treatment for all state serum permit holders. Any veterinarian, for example, holding such permit must have the privilege of coming to the storage agent and getting a fair share of available serum at any time." "We would reserve the right to make direct shipments to either veterinarian or owner in accordance with our regular conditions provided for this work."

The campaign against hog cholera in Iowa has been sufficient to demonstrate that vaccination must be one of the chief factors in preventing great economic losses from hog cholera; that temporary immunity is not satisfactory to the large majority of farmers; that virus will be used with serum more safely when under reasonable control than if we attempt to prohibit its use entirely; that Iowa had on January 1, 1915, a greater per cent of increase in hogs than any of the surrounding states; that a state should have one policy and continue without frequent changes, as anything else causes confusion, delay and heavy losses; that every factor which can be used successfully should be employed; that the first and most essential thing is to prevent heavy losses and that eradication necessitates organization and education over a long period of years; and finally, that it is folly to adopt new plans until they are known to excel the old.

A REVIEW OF RECENT PROGRESS IN HOG CHOLERA INVESTIGATIONS*

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Hog cholera investigations can be divided into two groups, namely, those of the laboratory and those of the field. These two groups naturally overlap each other, more or less, in all directions. In some instances it would be impossible to carry on certain laboratory investigations entirely independent of field studies, while the reverse is also true, but to a more limited extent.

At the present time the most important field investigations that are being carried on are those of the Federal Bureau of Animal Industry, started about two years ago, and being kept under way at the present time on a large scale, by an appropriation of $500,000 made by Congress and approved by the President under date of February 23, 1914.

According to a report[1] made by Dr. Dorset at the eighteenth annual meeting of the United States Live Stock Sanitary Association, held in Chicago, February 16–18, 1915, the work of the Bureau is divided into three major projects, as follows:

"Project A.—A definite area (one county) has been selected in each of fifteen states. Observations relative to the control or eradication of hog cholera are being made in each of these areas. The Department of Agriculture places, generally, three qualified veterinary inspectors in each area and furnishes the serum required for its work. The states are expected to co-operate by carrying on the needed educational work and survey the county, and by enforcing the necessary quarantine and sanitary regulations.

"Project B.—This project consists in the supervision of all establishments which conduct an interstate business in hog cholera serum and virus, and the work is intended to protect veterinarians and farmers against the use of worthless or dangerous serums and viruses. The work under this project is carried out entirely by the Department of Agriculture and consists in the inspection of serum and virus plants, the issuance of licenses to qualified establishments, the supervision of serum production in licensed establishments, the examination and testing of samples of serum and

* Read at the Minnesota State Veterinary Medical Association, St. Cloud, Minn.

virus, and the collection of evidence bearing upon violations of the law under which this project is established.

"Project C.—This consists of demonstrational and educational work among farmers, in co-operation with the state colleges. The idea pursued in this work is to organize clubs for educational, demonstrational, and other work in the prevention of hog cholera; and to work with county advisers and farm demonstrators to promote educational and propaganda work concerning methods of preventing hog cholera through sanitary and quarantine measures and the use of serum. The fundamental idea of this last project is to demonstrate to farmers how they may, by their own efforts, reduce losses from hog cholera.

"The work of the Bureau of Animal Industry may thus be said to consist: first, of educational work as a basis for its other activities; second, of control work to prevent the interstate shipment of contaminated serums and viruses; third, of experimental work in selected areas to determine the most effective and practicable means for reducing losses from hog cholera, and of finally eradicating this disease, if possible; and lastly, of laboratory researches on subjects concerning the etiology and prevention of hog cholera."

It should be borne in mind that these county experiments are not intended to demonstrate how to eradicate or control hog cholera, but, according to Dr. Dorset, they are rather a series of experiments on a large scale, by which it is hoped to ascertain the best and most practicable methods for the control of hog cholera.

Different plans of procedure have been adopted in the different counties. Healthy but exposed herds have been treated, some with the single and some with the double method. In infected herds hogs showing slight symptoms are usually given the single treatment, but the apparently well hogs are given either the single or the double treatment, according to the plan being followed in that particular county.

Not wishing to tire you with a lot of figures, I will give only a brief summary of the conclusions arrived at by Dr. Dorset, based on the data gathered and supplied by the inspectors in charge of the work in the diffierent counties.

Dr. Dorset draws no conclusions as to which is the best method of controlling hog cholera, stating that this question is of such vast importance and that the problem is of such immense difficulty that

careful preliminary work on a large scale must be carried on before recommending any kind of a nation-wide campaign.

Observations were made on the effect of the double treatment administered to pregnant sows, and Dr. Dorset considers that the figures indicate that the double treatment does not produce abortion in pregnant sows. Almost 1500 pregnant sows were treated under all conditions, with abortions in less than 12%, most of these taking place in infected herds, the sows being given the single treatment. The inference is drawn that the sows that aborted were really in the first stages of the disease, and the abortions were due either to this fact, or resulted from rough handling of the sows at the time of treatment.

Mention should be made of the figures gathered by Dr. Fischer[2] in Ohio, illustrating the same point. Fischer reports that less than 9% of the sows given the double treatment subsequently aborted, and that this rate is probably not higher than might be expected under ordinary conditions where no treatment whatever is applied.

At the State Serum Plant we have been able to make a number of observations along this line. It is rather the exception than the rule to have sows abort following the administration of the double treatment. We get quite a number of young sows from the stock yards, when we buy our pigs for virus purposes. If these young sows go over one hundred pounds we usually double-treat them, rather than inoculate them for virus purposes. These sows rarely abort, if they are pregnant, as many of them prove to be.

It sometimes happens that a pregnant sow is inadvertently hyperimmunized, for serum production, and either before being bled or during the bleeding process she is noticed to be pregnant. Such sows have frequently received from 1000 to 1500 c. c. of virus, without producing an abortion. Even the somewhat rough handling these sows receive, incident to placing them in the crates for hyperimmunizing or tail bleeding, has failed to produce an abortion.

Young sows not suspected of being pregnant have frequently been used for virus production. During the course of the disease, or at autopsy, their condition is discovered. Once in a while such young sows abort, but usually they do not. It has been observed that very frequently the condition of pregnancy seems to increase their resistance against the hog cholera virus. They show considerably less of a temperature reaction than the other pigs in the same group, and these sows are usually the last to succumb. We have

tested the serum drawn from a number of sows while in a pregnant condition, and have found it to be potent, according to the Government test.

Continuing with the work of the Bureau, Dr. Dorset has compiled figures on the effect of the double treatment on sterility. Observations were made on over 200 sows, treated and untreated. Of the treated sows 5.6% appeared to be sterile, and of the untreated sows 6.7% appeared to be non-breeders. Dr. Dorset naturally draws the conclusion that the double treatment, when properly administered, does not produce sterility in sows.

Perhaps the one great objection to the use of the single treatment that we most frequently hear is its failure to permanently protect, and the consequent reinfections in herds treated with serum alone. To see just how great an objection this was under practical conditions, observations were made on this point. In 1605 herds that were treated by the single method exclusively, recrudescenses occurred in about 5½%. The results in Renville County, this state, were even better than this, there being only about 4% of reinfections. Not a single drop of virus has been used by the Government veterinarians in the county, since the work was started over a year ago. Virus has been replaced by disinfectants in the attempts to keep down the number of recrudescences.

To the laboratory investigator, the most important lines of work, in connection with hog cholera, at the present time are:—

1. The isolation and artificial cultivation of the causative organism, with satisfactory proofs of its etiological relationship to the disease.

2. The perfection of an attenuated virus or a true vaccine, for preventive inoculation, to take the place of the dangerous, expensive and cumbersome double method.

3. The standardization of hog cholera serum, especially a method that is more accurate and less time-consuming than the only method in use at the present time.

4. A method for the quick and accurate making of laboratory diagnoses of hog cholera.

Before going further with this paper the author will take occasion to say a word concerning the publication of results of experimental and research work. There are two tendencies that are generally noticeable, namely, the tendency to publish results prematurely, and the opposite tendency to withhold valuable material

from publication. In the former case we refer to poorly drawn conclusions usually based on insufficient work, and published for the sake of obtaining priority. In the other case reference is made to negative results often obtained by investigators, or work conducted by them, which, through modesty, they do not think worth while publishing. In many instances much duplication of effort could and would be avoided if access could be had to these results.

Most of the laboratory research and experimental work on hog cholera that is being done at the present time is being conducted in the veterinary departments of our agricultural experiment stations, in many cases in connection with the state serum plants. This is true of such states as California, Kansas, Kentucky, Indiana, Minnesota, Missouri, North Dakota, Oklahoma and a few others. In some states this work is carried on by the state live stock sanitary board, as in Ohio and Pennsylvania. Considerable research work is being done in the scientific laboratories connected with our larger commercial producers of biological products.

One of the questions receiving considerable attention at this time is the isolation and cultivation of the specific causative organism of hog cholera. The value of a convenient and economical method for the artificial cultivation of the hog cholera virus can hardly be estimated.Numerous investigators have reported having seen all sorts of things in the blood of hogs infected with cholera. The work that has attracted most attention in this country has been done by Dinwiddie, of the Arkansas Agricultural Experiment Station, and by King and his associates in the Parke, Davis and Co. Research Laboratories.

Dinwiddie first reported his findings in a paper[3] read before the American Veterinary Medical Association, at Indianapolis, several years ago. His work has subsequently been published in bulletins[4, 5] of the Arkansas Station. Dinwiddie's organisms are intracorpuscular bodies, associated with the erythrocytes, while King's[6] organism is a spirochete. The latter is said to be relatively large, measuring five to seven microns long and one micron in width, being flexible, round and blunt at its ends, actively motile, and revolving around its longitudinal axis. King claims that this spirochete can be readily distinguished from bacteria on account of its lack of rigidity and its characteristic motility, which is described as being undulating, with the spirals fixed. It can be differentiated from blood films by its refractive properties and its characteristic morphology.

King, Baeslack and Hoffmann[7] report the examination of the blood of forty-eight normal hogs without finding any spirochetes, whereas the examination of the blood of forty hogs suffering with cholera, all revealed the presence of a spirochete. In the case of six hogs which recovered from the disease, spirochetes were found during the course of the disease, but were absent after recovery. The sick hogs referred to were infected with twelve different strains of virus.

Laboratory diagnoses of cholera were made in two instances by means of dark field examinations of blood revealing spirochetes. In other instances these were found a few hours before any symptoms appeared. Spirochetes were found with less difficulty in the blood of hogs suffering from the acute form of the disease. Spirochetes are easily demonstrated in the scrapings from the intestinal ulcers of hogs dead from cholera. The organism was also found in the crypts of the cecum and in skin lesions. Attempts to isolate the spirochetes from the spleen, liver, lymph-nodes, spinal cord, cerebro-spinal fluid, bile and urine were reported as having been unsuccessful.[8]

Hayes,[9] of California, has examined twelve specimens of blood from cholera hogs and reported that he was unable to find spirochetes present in any of them.

According to the latest report of the Chief of the Bureau of Animal Industry (1914)[10] the Biochemic Division has made some observations on the presence of spirochetes in hogs. These studies have shown spirochetes to be present in considerable numbers in the contents of the intestines, especially in and around the ulcers found in the intestines of sick hogs. Spirochetes could not be demonstrated in the blood, but large numbers of the same spirochete were found in the intestinal contents of healthy hogs. Based on these findings, the conclusion is drawn that King's spirochete is an intestinal saprophyte of the hog, and in no way connected with cholera. It may enter the blood with other secondary infections.

King holds to the belief that his spirochete is capable of breaking up into granules and that these granules may play an important part in the life cycle and physiological functions of the organism. They are present in the blood of cholera hogs, in cultures of *Spirochaeta suis*, and are capable of producing the disease in healthy hogs. Granules were not found in the blood of normal hogs, both susceptible and naturally immune.

These granules are undoubtedly the same as those referred to in annual reports of the Veterinary Division of the Indiana Experiment Station. Craig and Whiting[11] refer to them as irregular, round bodies or granules, similar to the forms seen in normal blood and known as hemoconia or blood dust. The same investigators also report having seen filaments in the blood, free and attached to the margins of the blood cells, in both healthy and diseased hogs, but more numerous in the latter. In an earlier report[12] the statement was made that these two forms of organisms undoubtedly bear a close relation to hog cholera, but proof of the fact that they are the direct cause of the disease has not yet been secured, because of the fact that it has thus far been impossible to isolate them. In a later report,[13] referring to the filaments, they state that they are to be considered as a clinical phenomenon, the result of disintegration of the erythrocytes. The same report states that the so-called granular bodies show a tendency to increase in number when placed in artificial culture media. The nature of the media used is mentioned in the latest report available[14] and they consisted of milk, hay and meat infusions and bouillon, and various sugar media. More than 60 germ-free filtrates were studied with the aid of a Zeiss ultramicroscope.

In summarizing their work, King and Hoffman[15] claim to have practically fulfilled Koch's laws, in so far as it is possible with an organism possessing the biological characteristics of the spirochetes, and that it may logically be concluded that *Spirochaeta suis* is more established as the specific cause of hog cholera than any other known organism.

King and Drake[16] have suggested the possibility that, at some time or period in its life cycle, *Spirochaeta suis* is capable of passing through bacteria-proof filters.

In this connection it might be well to call attention to the work of Von Betegh.[17] This investigator claims that the ultra filtration of the filterable virus of hog cholera is questionable. He states that the virus, in the form of the heart's blood, emulsions of spleen, kidney and lung tissue, after being filtered through a Bechhold disc collodion filter, did not produce hog cholera when injected into young pigs. He believes that the viruses that we usually call filterable are not filterable at all, and that their filterability depends entirely on the filter used. The unfiltered virus contained strongly refracting bodies and organisms resembling spirochetes,

and when cultivated on agar, showed colon bacilli, bipolar organisms, and others resembling *Bacillus suipestifer*.

In their latest publication, King and Drake[18] announce that a pure culture of *Spirochaeta hyos* (formerly *Spirochaeta suis*) has been secured and that typical hog cholera of the acute type has been produced by inoculating a hog with this culture.

Two German investigators[19] recently startled the scientific world with the announcement that they had isolated and cultivated the causative organism of hog cholera, but this work was not reported in detail, and the methods of isolation and cultivation were not given.

Arnheim[20] has criticised the findings of King and his co-workers on the ground that up to this time spirochetes have not been filtered under pressure, and furthermore that salvarsan, a well-known spirochete poison, is not of any value in hog cholera. This investigator was able to demonstrate spirochetes in the blood taken from the tails of infected hogs, but was unable to find them in the heart's blood. He was able to find them in the intestinal tract. He believed that the spirochetes found in hog cholera originate from the intestines.

Uhlenhuth[21] has made a study of the effects of various disinfectants upon the hog cholera virus. He found that corrosive sublimate and carbolic acid would not kill the virus in a comparatively short time. A six per cent cresol soap solution and calcium hydrochloride in varying dilutions destroyed it within one hour. The virus is very resistant to cold, (as we know by experience in Minnesota) but it is killed by drying at a temperature of 78°C. Heatings for one-half hour at 58°C. do not rob it of its disease producing powers. Virus inclosed in fermenting manure is killed. It was also found that hogs which have apparently recovered from hog cholera, but for some reason are in an unthrifty condition, frequently prove to be virus carriers. The secretions from the eyes and nose disseminate the virus.

Several laboratories have made observations on the bacterial contamination of hog cholera serum. Hayes,[9] in California, concludes that practically all anti-hog cholera sera contain living bacteria. A species of streptococci predominated in all sera he examined. He found that hyperimmune hogs do not give off bacteria in their blood, and that the greatest opportunity for organisms to gain entrance to serum is during the process of defibrinating and

bottling. Organisms multiply in serum preserved with one-half of one percent of phenol. Hayes believes that a high bacterial count does not necessarily predispose to abscess formation.

The Indiana Experiment Station[14] reports the purchase of samples of different commercial sera and the tests of these, both for purity and potency. Bacterial counts in the different makes of sera varied from 30,000 to 125,000,000 bacteria per cubic centimeter.

The Kentucky Experiment Station[22] has also made some bacterial examinations of serum. Dr. Graham reports in this connection that some sera which they produced contained no bacteria, while others contained as high as 65,000 per c. c. No relation could be observed between the bacterial content and potency. Serum that showed the presence of secondary bacteria proved just as potent as sterile serum. He recommends the determination of secondary bacteria in serum as a requirement in routine serum production, the samples for bacteriological examination to be taken from the mixing tank at the same time that a sample is taken to determine the potency.

Something that is very desirable is a method of standardizing hog cholera serum. This problem has been attacked in two directions by different groups of workers. Reichel[23] had the problem in mind from the virus side, believing that if we had a fixed virus of hog cholera, as we have for rabies, it would be easier to produce a standard serum. In a recent publication the author[24] questioned the feasibility of this, for several reasons. The great variations in immunity and susceptibility of different hogs toward the hog cholera virus makes the problem a difficult one. The secondary infections met with in hog cholera, not present in rabies, tend to complicate matters and make the problem harder. However, if it is possible to get a fixed hog cholera virus, I believe we have it at University Farm at the present time. The virus which we are now using at the State Serum Plant is now going through its 120th passage, and appears to be as virulent as it is possible to get it.

Haslam and Franklin[25] have endeavored to standardize serum in the finished product. Their methods involve the use of test pigs and the index of the potency of the serum under the test is gauged by the reaction shown by the test pigs. In any test where pigs are used, great variations in natural immunity must be taken into consideration, these extremes varying from what appears to be a perfect natural immunity up to extreme susceptibility.

Haslam[26] has made one of the most sensible suggestions that we have heard of for some time. Briefly it is to test serum in large quantities, using a correspondingly large number of test pigs, on the assumption that the exactness of the test varies with the number of test animals, the greater the number of these the greater the accuracy of the test. Haslam suggests testing serum in quantities of 500,000 c. c. at a time. This is from three to six times as large a quantity as is usually tested at one time, but by using from three to six times the usual number of test pigs, the expense is no greater and a very much better idea of the potency of the serum can be obtained.

What appears to be an encouraging piece of work is that reported by Dr. John Reichel,[27] of Mulford's scientific staff. He has refined or concentrated hog cholera serum by a rather complicated process of precipitations and filtrations into one-half, and even less, of its original volume. The anti-bodies in the serum appear to be associated with the globulins, as shown by Reichel in his work, and also some work done in the Biochemic Division of the Bureau of Animal Industry, under the direction of Dr. Dorset.[10]. Reichel's refined serum is sterile and free of a large portion of the inert substances of hog cholera serum as we are accustomed to use it. In a recent communication, Dr. Reichel informed me that plans were under way to place hog cholera serum globulin on the market, but that a great deal of work on it remained to be done, indicating that there were several difficulties to be overcome before it would be possible to market it in competition with serum.

None of the investigators who have claimed to have cultivated the hog cholera organism, have reported any attempts to attenuate their organisms, with a view to perfecting a vaccine. Apparently the only work that has been done along this line is the continuation of the experiments to prepare a vaccine by heating virus to different temperatures for varying periods of time. Graham and Brueckner[28] have published their results and conclude that virus heated at 60°C. for one hour may produce cholera, and pigs inoculated with such a virus, even if they do not develop cholera, are not necessarily rendered immune. The same dose of vaccine may kill, protect, or non-protect inoculated animals of the same size under similar conditions. For these reasons they believe that attenuated virus is worthless in rendering swine immune to cholera.

This is rather in direct contrast to the favorable results re-

ported by Peters[29] several years ago. Craig reports some work done along similar lines at the Indiana Experiment Station.[14] A mixture of one part virus and two parts normal salt solution was incubated at a temperature of 37.5°C. for 24 hours. Then this mixture was heated from one to two hours at temperatures varying from 60 to 65°C. Of 62 pigs inoculated with the heated virus, 60 died of acute cholera. Of 23 pen exposure checks, 21 died of cholera.

Lewis, Shuler, McElroy and Ritter,[30] of the Oklahoma Experiment Station, have attempted to prepare a vaccine by passing virus through the bodies of immune hogs. The work was done first with a view to determining how long the virus injected for the purpose of hyperimmunizing remained virulent. Blood drawn from a hog as early as 24 hours after hyperimmunization and used as a vaccine, apparently protected four pigs, but the value of the experiment is lost, owing to the fact that no control pigs were kept, or at least reported.

About two years ago a hyperimmune was bled, by mistake, on the fourth day after hyperimmunization, at the State Serum Plant. The error was detected before the blood was mixed, and accordingly was kept separately. The question arose as to whether it contained any virus, or sufficient antibodies to be used as a protective serum. Four pigs, weighing from 15 to 25 pounds, were inoculated with varying amounts of the vaccine(?). One pig that received one cubic centimeter died of cholera on the 23rd day. The second pig developed chronic cholera and died on the 40th day. The third pig passed through an attack of cholera and recovered. The fourth pig, although it received 15 cubic centimeters, likewise passed through a mild attack of cholera and recovered. Both of the latter pigs were badly stunted, and never were thrifty again, having been kept under our observation over six months. This work was taken up again recently, but apparently the results are extremely variable, so much so that I would prefer not to say much about them at this time.

With the exception of the work of King, Baeslack and Hoffmann,[7] already referred to, the problem of diagnosing hog cholera in the laboratory has received comparatively little attention. A number of investigators have from time to time thought of the possibilities of the complement fixation test as being of assistance in this respect. The chief difficulty seems to lie in securing a suitable antigen. At the Missouri Experiment Station, Connaway and

Durant[31] have been doing some work along this line. In their preliminary report they state that they used, as antigens, blood and extracts of spleens of virus pigs. Apparently they obtained rather irregular results.

The only other work of a similar nature reported has been done by Healy and Smith[32] of the Kentucky Experiment Station. They used an extract of the mesenteric lymph-nodes and state that this antigen shows striking differences in its reactions toward sera from normal hogs, rabbits, cows and hyperimmune hogs. They state further that the antigen is not present in the freshly prepared gland extract, but requires a definite period (eight days in most cases) for development; the antigen passes through an ordinary porcelain filter, but not through an "F" bougie.

Along the line of laboratory diagnosis the Pathological Division of the Bureau of Animal Industry has done some work of a histological nature, in an attempt to differentiate between cases of hog cholera and glomerular nephritis, in both of which conditions the kidneys very frequently present petechial hemorrhages. In the last report[10] of the Bureau, it is claimed that these two conditions can be differentiated under the microscope very readily, and the conclusion is drawn that the presence of hemorrhagic kidneys alone was not sufficient for a diagnosis of cholera. We have noted this hemorrhagic condition of the kidneys in young pigs suffering from necrobacillosis, and it undoubtedly has been the reason for a number of mistaken diagnoses and as many unsatisfactory experiences with serum.

In closing I wish to mention one other experiment, conducted by Birch,[33] of the Cornell Veterinary Experiment Station. He has fairly well demonstrated that under our present meat inspection regulations it is possible for the carcasses of hogs harboring the virus of hog cholera to be passed for food. This was demonstrated by feeding to susceptible hogs pieces of pork from pigs inoculated with virus, and killed before the appearance of macroscopic lesions. These pork scraps were fed fresh, refrigerated and cured. It is readily realized how cholera may be spread by feeding uncooked pork scraps to hogs. Thousands of hogs in this country are fed on garbage, and although a great majority are probably kept immunized against cholera all the time, those in uninfected territory may not be. Here lies the danger, namely, that the disease may be spread by these infected pork scraps, into previously uninfected

territory. Canada, in a way, rather blames a great deal of her cholera on this source of infection, according to Rutherford[34] and McGilvray.[35] The Pathological Division of the Bureau, in their most recent report,[10] refutes this claim, at least in so far as brine-pickled and dry-salted pork is concerned. Portions of bacon from hogs in different stages of cholera were brine-pickled and dry-salted, and then fed to susceptible hogs without producing the disease. The same hogs were subsequently shown to be susceptible to cholera by inoculations with virulent blood.

A review of these hog cholera investigations has been made at this particular time because we believe that the time is not far distant when the Experiment Station will be able to devote considerable time to research and experimental work along similar lines. With increased facilities and more help for serum production, as well as additional space and equipment for experimental work, I feel safe in saying that we will be deeply engaged in this kind of work before this year is out, and that serum production will be subsidiary to research work.

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URINARY LITHIASIS IN BOVINES*

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In dealing with this subject it is not our aim to go into technical or theoretical points, but to deal with it solely from the practitioner's point of view.

Since literature on this subject is very brief, therefore we shall confine ourselves mostly to our observations.

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The ox is a very peculiar quadruped, presenting but few characteristics in common with the horse or other domesticated animals, and therefore, is prone to manifest in a different way the symptoms of the disease which he and the horse may have in common.

ETIOLOGY. The exact cause of urinary calculi is not yet fully understood; yet we can all agree that the ox is often afflicted with these lime deposits and I believe from his peculiar diathesis that he is more subject to this affection than most other ruminating animals unless it be the sheep.

Why some cattle possess calculi and others not, with identically the same food and water, is beyond my knowledge. My belief, however, is that it comes from some derangement in the function of the kidneys or other perverted chemism.

Most writers claim that the trouble arises from the kind of food they eat or from the water they drink. If this be the case why do not cattle given an abundance of wheat bran, clover, hay, sugar beets, and lime stone water oftener become affected than those on a succulent nitrogenous diet?

My observation for the past twenty years fails to verify the opinion that any special kind of food or water have any material effects in producing calculi. (See postmortem No. 2).

The more thrifty and plethoric animals seem to be oftener affected, and those on forced or full feed much oftener than those that are thin and on scant rations.

Observations have further shown that sheep on forced feed are much more prone to these lime deposits than those that are not heavily fed.

Therefore, my conclusions are that the chief cause seems to be from excessive feeding in a majority of the cases; and that the drinking water, temperament and hereditary predisposition are but small factors.

CLASSIFICATION OF URINARY CALCULI. The classification is most conveniently made according to the location in which they are found.

1st, Renal calculi found in the kidney which may again be subdivided into

(a) Calculi of uriniferous tubes.

(b) Calculi of the pelvis of kidney.

2nd. Uretral calculi found in the ureters.

3rd. Vesical calculi found in the bladder.

4th. Urethral calculi found in any place in the urethra.

5th. Preputial calculi found within the sheath.

Calculi may also be subdivided according to their chemical composition, but this would afford no guide to their location or symptoms, as calculi of the same chemical composition may be found in any part of the urinary tract from the kidneys to the sheath.

It is my belief, which is further substantiated by postmortem, that the formation of *most*, if not *all* urinary calculi in cattle, begin or originate in the kidneys and that they pass from there on to the different locations in which we find them.

I can not accede to the belief that these urinary calculi have a nucleus of some foreign body around which these salts have been deposited, neither do we find those concentric rings representing the layers that have deposited in succession as in lactiferous salivary calculi and bezoars.

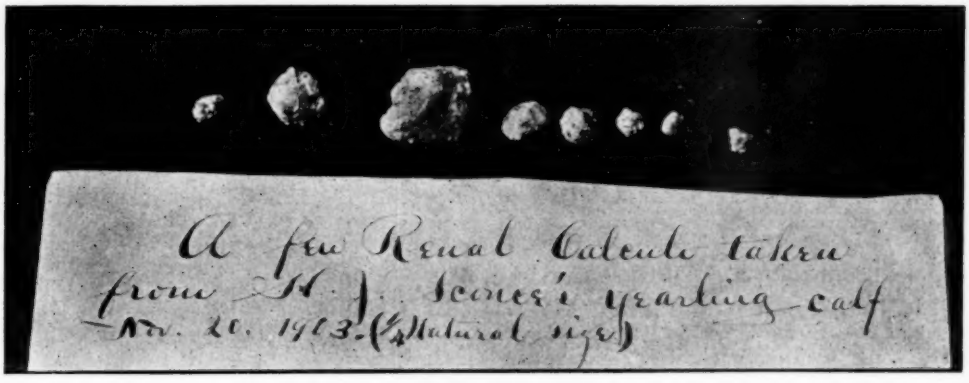

FIG. 1.

The form or shape of these calculi will vary according to location in which we find them. This is more especially true if they have remained in the same location or position for any length of time.

In the kidneys they are usually of a spherical outline and small, and the adhering of several of these smaller ones constitute those larger ones whose sides are rough, resembling a mulberry surface.

Again they may present smooth or polished surfaces as when found in the bladder and no doubt these cystic calculi become polished by remaining in contact with other calculi in the bladder for some time.

Urethral calculi may present either a smooth or roughened surface and if a *roughened* surface, we conclude that it has either come directly from the kidneys, or that there are but few if any more remaining in the bladder.

If we remove one from the urethra that has a *smooth* or polished surface we conclude that there are *many* calculi yet remaining behind to give us trouble.

SYMPTOMS. As a rule there are no premonitory symptoms of *any* disturbance until a calculus passes into the urethra. Postmortem case number two, which is given here is the only one in my experience that ever showed any symptom of calculi previous to the blocking of the urethra with a calculus.

In order to obtain a better understanding, we shall divide the symptoms into two classes.

1st. Those shown by partial occulusion of the urethra.

2nd. Those indicating the complete blocking of the urethra.

In partial occulsion but little if any physical disturbance is noticed but later on we see what resembles a large fluctuating abcess on the median line in front of the scrotum, but seldom behind it.

This fluctuating mass may extend to either side from the line of the penis and extend over considerable of the inferior surface of the abdomen.

In other and still more protracted cases of partial occlusion we see a fistula on the median line between the sheath and scrotum of both the urethra and the skin, and the urine escaping here during micturition.

These cases are the result of partial occlusion of the urethra by a calculus, enough water escaping all the time to prevent death, but the entangled calculi causing a fistula of the urethra and other coverings.

It is not uncommon to be called to see other neglected cases to find no evidence of pain, and the only symptoms would be that the animal was apparently bloated, sluggish, not eating, and breath slightly impregnated with uriniferous odor.

On palpation of the rumen in these cases we fail to find any symptoms of gastric tympany, but might conclude it was a case of ascites until given further examination. Upon physical examination of the bladder per rectum it is often possible to find it full, tense, and yet the abdominal cavity contains many gallons of urine. In many cases of this kind postmortem reveals no rupture of the

bladder, but a weak, degenerated condition of the walls of the bladder and ureters, thereby allowing the urine to escape by a process of osmosis. No treatment is available in these cases. In *complete* blocking of the urethra pain is exhibited from the first, by dullness, refusing feed, then shifting of hind limbs, colicky pains, twisting of tail, then alternately raising and lowering of tail as in the act of micturating, the alternate contracting and dilating of sphincter ani, and in the later stages the animal will kick at the abdomen, moan and strain violently, as if trying to defecate.

Manual examination per rectum should reveal a tense, full condition of the bladder and slight pressure on the same would cause excruciating pain. It is *seldom, if ever,* we are able to locate the exact place of the obstruction in the urethra in the male, by external manipulation on account of the diminutive size of the calculi and the deep coverings of the penis.

In the female the symptoms would be similar but the diagnosis much easier and surgical interference is seldom if ever required.

TREATMENT. Medicinal treatment seems to avail but little in these cases, yet there are a great many so-called solvents, such as potassium acetate and citrate, lithium salts, hydrochloric acid, bicarb, soda, etc., but as a matter of fact all we know positively, is, that these medicinal agents *tend* to dissolve calculi in the test tube, that is outside the animal body, and it is very questionable whether they retain the same power while circulating in the blood or other tissue fluids.

It seems possible that early treatment might tend to check the formation of new calculi, but hardly credible that these medicinal agents would be able to perform the same function when we only administer a few drams of these different nostrums by the mouth, or that any part of them should ever reach the calculi in a way to be of any therapeutic benefit.

Belladonna, opium, chloral, etc., may be given to temporarily allay pain, but otherwise the time for medicinal treatment is long past before the practitioner is called.

All physical treatment or those by mechanical manipulation have availed nothing at my hands, so will not be considered here.

SURGICAL TREATMENT. Surgical treatment will be considered only in relation to the male animal as those are the ones that we are more frequently called to deal with, and the ones presenting the most serious trouble.

After careful examination per rectum you find no indication of urine in the abdominal cavity and the bladder is still distended and tense, we would first puncture the bladder through the rectum with a small trocar, allowing all the fluid possible to escape in order to relieve the tension of the bladder and so avoid possible rupture of the same in casting the animal.

One of three locations may now be selected as the seat of the operation.

1st. Ischial region. sometimes selected especially in fat cattle about ready for the market.

2nd. Post scrotal region. This is the location most generally selected for the removal of the calculi from either curve of the penis.

3rd. *Pre-scrotal region* selected for removal of calculi in anterior portion of the urethra. It is so seldom that a calculus lodges in the anterior portion of the penis that it is hardly advisable to operate in this region.

Modus Operandi. To operate in the ischial region, cast the animal on the left side and secure all feet as near as possible in the extended position, in order to retain the structures to be operated upon in their normal position.

In *some* animals the operation might be performed in the standing position by the use of a local anesthetic.

The incision should begin at a point near the ischial arch and extended down parallel to the penis four or five inches. On further exploration, after the incision is made, we first come in contact with the two suspensory or retractor muscles, and just anterior to these the penis will be found. By firmly drawing the penis out of wound, sever it at the lower edge of the incision, and if there is no stoppage between the bladder and incision the urine should flow freely. If urine fails to flow, pass a director into the bladder to dislodge any calculi, mucus or blood clots that may be obstructing its passage.

Any excessive hemorrhage may be checked by firmly pinching the stump of the penis for a few minutes.

After thoroughly cleansing, stitch up the wound in such a manner that the stump of the penis will be held firmly between the edges of your incision and also allowed to extend a quarter or half inch beyond the surface of the skin. It has been recommended to insert a tube in the stump of the penis to prevent it closing, but my experience with the tube has been to always have a stricture at

the upper end of the tube in the urethra which was far, far worse than a stricture at the end of the stump.

The operation in the ischial region is not performed with a view of removing the calculus as it is seldom found here, but to give temporary relief with a view of an early market.

The anterior portion of the penis and the calculus which, in all probability lies in this part, are allowed to remain.

For operation in *post scrotal* region, cast the animal as before but secure right hind limb up to side of abdomen and toward the shoulders.

Make your incision along the median line, beginning about a hand's breadth behind the scrotum and extending back four to six inches. By making a long incision here we are enabled to reach both superior and inferior curves of the penis more easily. Separate the two parts of the retractor muscles to some extent as your incision is made.

The penis can now be located and by gentle traction and manipulation we should be able to locate the calculus either in the superior or inferior curves of the penis, although to the unpracticed hand this is not always an easy matter on account of the diminutive size of the obstructing agent.

After locating the calculus, cut down through the *corpus cavernosum* into the urethra and remove the stone by a little pressure, or if rough and entangled in the swollen mucous membrane the knife is required to dislodge it.

When the calculus is in either of the curves it is preferable to cut into the corpus cavernosum from the side of the penis to the urethra. Some prefer making the incision from the under side of the penis as the urethra is not so deeply situated, but by making the incision in the side we have less gaping in the folding of the penis.

The incision should be made just as small as possible for the removal of the calculi. Don't be content with removing but one calculus but carefully examine before closing the wound for others as it is not at all uncommon to find two or more lodged in the same locality. A gravel located in either curve of the penis would not be over three-sixteenths to one-fourth inch in diameter and in a bull with a large penis is not always easily detected.

After the calculi are removed and the urine has escaped, examine the anterior portion of the urethra to be sure that this part contains no obstruction, as often times the mucous membrane of the

urethra anterior to calculi is so irritated and swollen that it is impossible for the animal to urinate naturally even after the calculi are removed. If the anterior portion of the urethra was not obstructed I would then close the wound in the penis with silk or catgut suture and also close the wound in the skin with two or three stitches and after treatment would be as for any open wound. If on the other hand we find the animal is unable to pass the urine through the anterior portion of the urethra we must sever the penis at the point where the calculi were removed and secure the remaining stub of the penis to the sides of the skin incision, thereby affording a place for micturition through the wound back of the scrotum.

All treatment in the male must be considered only as a means of temporary relief, and not as a permanent cure.

Post Mortem Appearances. Postmortem appearances on animals afflicted with urinary calculi will sometimes be astonishing to the operator. As an illustration we will consider two very interesting cases on which autopsies were held.

Case No. 1. Case number one was that of a five-year-old registered short horn bull weighing 2800 pounds and was being fitted for show purposes. This animal was apparently in the very pink of health until on Wednesday evening in the fore part of August, the animal was taken suddenly ill. After a thorough examination, the case was diagnosed as one of urethral calculi. Considering the use to be made of the animal and the seriousness of the operation in so plethoric an animal, his destruction was advised. The postmortem in this case revealed no calculi at all in the urethra, but the mucous membrane throughout the whole length of the urethra was badly swollen, black and congested. The inner walls of the bladder presented the same appearance as that of the urethra, only in a worse state of decomposition; the interstices between the mucous and muscular coats tending to suppuration. The mucous coat could be torn loose from the muscular coat in one solid sheet of diseased tissue. On the floor or internal inferior surface of the bladder, extending from the fundus to the beginning of the urethra, was one solid sheet of a tough gelatinous deposit, and imbedded in this gelatinous deposit were thousands of calculi varying in size from a small mustard seed to that of a common, white bean.

The ureters seemed about normal, but the pelvis and tubules of the kidneys contained a great number of small calculi, and a small amount of gelatinous deposit.

The cessation of micturition in this case seemed to be caused by the swollen and congested state of the urethra and the gelatinous deposit in the bladder and not from any single calculus.

CASE No. 2. Case number two was a white registered short horn steer, calved the last of October, 1902, and destroyed the first of November, 1903. It was the intention of the owner to fit this calf for the fat stock show, and the calf was allowed to nurse two cows, both of which were heavy milkers. This calf thrived well until the middle of the following February, when he was taken ill with symptoms of cystitis. The treatment was given with apparently complete recovery, but the owner was appraised of my belief that calculi were the initial cause of the trouble.

May 28th, following, I was again called, and found the calf showing typical symptoms of urethral calculi. The animal was cast and we operated in the post-scrotal region; calculi were found in the superior curve of the penis.

The anterior portion of the urethra was so badly swollen and congested that the urine failed to pass satisfactorily so the retractor muscles and penis were severed at this point and the parts arranged to accommodate the passage of urine in the rear of the scrotum.

This animal seemed to make satisfactory recovery, and gained ninety pounds in July and seventy pounds in August. About September first he began to decline, get stupid and refuse feed until in the last of October he was destroyed.

On post-mortem the urethra in the remaining stub of the penis was in about the same condition as that of case number one. The bladder was about the same as in the other case, but containing a greater abundance of small calculi, although there was not so much of the gelatinous deposit.

The left kidney contained a considerable number of small calculi. The right kidney was about five inches in diameter and ten inches in length. The tubules and pelvis of this kidney were a veritable sand bank. The calculi in this kidney ranged in size from a mere atom to an agglutinated mass that was three-quarters of an inch in diameter.

Taking into consideration the complete history of this calf, my conclusions are that this animal was affected with urinary calculi while very young, and also at a time when his sole diet was only milk.

ABSTRACT OF DISCUSSION.

DR. MAYO: A stock man in Cuba sent me an eight ounce bottle which was nearly filled with calculi taken from an ox's bladder, which varied in size from very small shot to that of a large pea. Most of these looked almost like gold beads. They were of a brilliant metallic luster and were arranged in consecutive layers. Some were dull on the outside, and if you took off the layer you would get a beautiful spherical lustrous calculus.

I do not know the cause of this beautiful irridescence, but an ordinary handful looked like gold beads of a rather dull color.

DR. JOSEPH HUGHES: Dr. Jones seems to have a corner upon calculi and the urinary deposits, especially in the bladder and urethra. He has, prior to now, published many of these remarks and observations in the Press.

I have seen this disease in many of the Middle Central States. Just a few weeks ago I was studying the symptoms in a bull in which my diagnosis was correct, and yet I was at sea as to what to do. The herdsman was absent and no one seemed to know much of the prior history of this animal. The owner invited me to remain and visit with him for half a day, until the herdsman returned, and he told me that on several occasions the bull had the same symptoms, and by waiting and giving him the usual nitre he expected a calculus to pass in a short time, and sure enough it did. It was very small, but it gave prompt relief to the animal. The animal was nervous, irritated, a full bladder—showing all the symptoms of the renal colic. All these subsided in a short time.

To me these urinary deposits are of extreme interest. It took me just twenty-five years' search to find the calculus in a horse, and on many occasions I thought I had the symptoms and thought I would have the opportunity to demonstrate my surgical ability, and strange to say the operation was a very remarkable success. Then followed two or three in rapid succession. In the meantime I acquired a very fine collection of calculi.

In the dissecting room, during twenty and thirty years' experience, I got some marvelous specimens of renal calculi, one as large as my fist. It was in the horns of the pelvis and like a pipestem in the ureter.

Another specimen was sent me by a veterinarian, in which the animal died of colic. He found in the pelvis of one kidney a simply

enormous calculus that was never suspected before. How the secretion of the kidney could pass, unless the pelvis accommodated itself to the enormous bulk of this, was a problem. But we have in the bull, especially, a remarkable problem with regard to these formations. We have, first of all, an excretory channel that is very singular.

The urethra in a bull is widest at the bladder and tends to contract all the way through, and, of course, at the extremity of the penis, is extraordinarily contracted. The calculus is bound to become lodged just as soon as it reaches the contracted portion, or a portion sufficiently contracted by the lumen of the penis. At the same time, many claim to get wonderful effects from Belladonna, Saw Palmetto, etc. That is a combination by which I have succeeded in relieving these symptoms of marked adhesiveness in bulls. We do not always find the calculus.

I have seen dogs treated with this same mixture, and the proprietary preparation, Sanmetto. I have seen dogs put on that and it was marvelous the number that would pass. They came out in a regular handful and actually filled the bottle—nearly a two-ounce bottle—and to me it was a demonstration that we have drugs that are effective under certain conditions.

Must we stand by and see a wonderfully valuable animal die, and still feel that we have not confidence to take our knife and search for that small calculus? But when we come to see the small diameter of the urethra and come to think of the curve—the "S" of the penis—tangled in there back of the scrotum—the "S" is situated above the scrotum and behind it—it is a rather discouraging thing, to say the least.

It oftentimes occurs to me there should be some device by which we could explore that canal in the bull. It looks discouraging. But this surgery along the tract, while it may be productive of relief, leaves the animal, ordinarily, a useless breeding proposition.

DR. C. J. MARSHALL: I have had many cases in dogs and it is a simple operation to locate them in these animals. You locate them with a catheter and they usually get well; but I was wondering how he could locate a calculus or how he would know where to put his catheter. It is remarkable to me how he would make the diagnosis. I might know the animal could not urinate, but I would not know whether the calculus was to blame for it or not. I would like to know a little more about he locates them.

I have had a few cases of calculus in cats, and it is a pretty hard matter to handle them. The urethra is small the penis not large, and it is difficult to do the operation. I was never able to handle an operation of that sort very successfully, but I remember a very nice Angora male cat that was taken sick and frequently attempted to urinate and passed a few drops of blood, and that was about the only success he had in trying to urinate. I hesitated about trying to operate and I prescribed Sanmetto, and I was surprised at the results.

I have tried it on dogs but with no success, and it always terminated in an operation with them; but I am satisfied in cats you can get good results in using Sanmetto.

DR. JENSEN: With reference to the cat,—how do you know it is calculi?

I have had some little experience in years gone by with cattle,—but I always found them on post-mortem.

Some years ago I was called to see a case belonging to a ranchman outside of our town, and I found the steer with what I thought to be a case of dropsy, leaning against the rack. I am quite sure it was dropsy by what I found afterwards. In making the examination I could feel any amount of what I suspected to be gravel, and furthermore, the condition of the animal was such that I did not encourage any treatment at all and induced them to kill it. The only surgery I did was a post-mortem. There I found a ruptured bladder and I have some of the specimens of calculi here—seven as big as a hazel nut. There was a teacupful. The urethra was completely blocked.

I have put up a great deal of Sanmetto for physicians on prescription. I am really marvelling at its send-off.

As to the nitrous ether, I cannot understand why it should get that action. It is supposed to stimulate urinary secretion, and the only theory I can advance is that it possibly does.

With reference to the results that the herdsmen get from nitrous ether,—that is another eye-opener. I simply cannot account for it. I am so interested in this matter that I hope before long I will be able to find out.

DR. JONES: Dr. Marshall wished to know how I knew it was a calculus. I am pretty sure it was. The cat was passing blood, and upon palpation, I found an enlargement on the penis.

DR. HUGHES: I would like to take issue with Dr. Jones in re-

gard to the action of Sanmetto, because wherever there is urinary irritation, one naturally seeks the dispensary or pharmacopœia for a remedy. You do not want to use the knife immediately.

Now, we do get marvelous results from Sanmetto. I do not do dog practice or cat practice. Saw Palmetto is a common drug. I get the combination and get the most marvelous effects in animals that are profusely urinating. Just at this time, in my own practice, there are cases in which the symptoms are largely kidney, and one is astonished at the effects—where the urination is a steady, dripping—dripping.

You say that Saw Palmetto is a urinary stimulant. It has, in my opinion, a distinctly retarding effect upon the eliminations of the kidney. It may have a tonic effect. I do not know what a tonic is. The term "tonic" does not stand for anything, but it seems to get the cells of the uriniferous tubes active—to get them through the nervous system.

I believe with Dr. Marshall that it is out of the question, in the majority of these cases, to locate the calculus. I think I know my anatomy fairly well, and just exactly the course taken by the urethra from start to finish, and I have gone over it and failed absolutely to find the location, although I knew it was calculus, but I play a winning game many times.

This question in the case of the bull cannot be over-estimated.

DR. JENSEN: Dr. Hughes was speaking of calculi and not of the irritated condition of the urinary canal.

I stated that the action of those drugs was stimulating in colic. We find the condition of urine is due to the hyper-acidity of the urine, which would be apt to be true in cats and dogs, owing to carnivorous habits. The bull is not carnivorous. At least I have never seen him at it. But owing to the hyper-acidity which naturally would be expected in those conditions, Saw Palmetto will neutralize the condition and hence remove the cause. The general conception of Buchu is that it is a diuretic. There is not much to it except that it disinfects, due to certain chemical action. It disinfects the kidney.

DR. O'NEILL: I would like to ask Dr. Hughes if he considers it an impossibility, owing to the structure of the urethra of the bull, to pass a catheter? That is, where we have no obstructions—and for diagnostic purposes.

DR. HUGHES: The question put by Dr. O'Neill has often appealed to me, but when one comes to lay open the tract or to probe it, to take into account its wonderful length, the fact that its caliber is so small at the outlet and so large at the bladder, it would look as if it were impossible. Besides in order to make it practical, one would have to be able to seize the extremity of the penis. To do that would cause considerable difficulty.

DR. O'NEILL: Would you anesthetize your animals?

DR. HUGHES: No, but when you come to manipulate the sheath of a valuable animal you are liable to have an adhesion—in fact, the surgery of this tract looks like a nearly impossible problem.

I hope that we are nearing the time when our younger men will succeed in devising some way of effecting that.

DR. O'NEILL: We have had in this last year, perhaps, more trouble than we have had in our experience in treating bulls, but we have been treating some full-bloods. In our section we are bothered with fox-tail. We find that they lodge around the end of the penis—the upper portion of the scrotum—and you will find that they get tumor formations, and we have simply to find means of dilating and removing or throw up our hands, and we have passed one or two catheters. We have dilated simply by using a force-pump and grasping the end of the scrotum and using force enough to dilate and to break down the adhesions, and we have succeeded in three cases of very valuable bulls, which would be otherwise useless.

By laying these bulls down and putting them to sleep under complete anesthesia, I am able to grasp the end of the penis, and by pulling forward tensely enough, can straighten it.

DR. JONES: Mr. Chairman, I am not expert in diagnosis on this urinary trouble, but it gives me as little trouble to diagnose a urinary calculus as anything I have.

In the first place, we were fortunately working on an animal in which we could make a manual exploration per rectum. By lubricating the hand and inserting into the rectum fifteen or eighteen inches and bearing down, it is very easy to detect an extreme. tense hard condition of the bladder. At the same time, the animal will invariably strain and many times will bellow from pain.

Another set of symptoms: If we are all observers, (which we should be, and I think are), and would observe the steer or the bull in the act of micturition, there is a continual pumping of the tail

up and down, for relaxation, and contraction of the sphincter ani. Invariably those go with the male animal in micturition. When they are affected with calculus you will find them continually affected with that motion, and if you are observant there is no passage, and by manual exploration we arrive at the conclusion that the animal is affected with calculi, although in Case No. 1, as I said—a registered short-horn,—and five thousand dollars would not have been any temptation to that owner of that bull. It was a serious proposition in that case.

On the post-mortem we did not find any calculus in the urethra, but from the irritation, from the bladder on down throughout it was occluded beyond any possibility of urine escaping through the urethra.

The symptoms that I have just related would hold good in all cases. If there are any further questions about the symptoms, I will answer them; if not, I will remark on treatment.

DR. MARSHALL: How do you locate the calculus when it is not in the urethra?

DR. HUGHES: How do you locate the calculus between the pelvic arch and the extremity of the penis?

DR. JONES: I think that I said in my paper that I had never yet been able, by external manipulation to locate anything, notwithstanding we were taught that way. It is a fasle idea. Not only that, many an operation have I had when it was hard to detect a calculus not larger than a grain of wheat—with the penis exposed. I was in company with a very eminent surgeon at one time. He was operating as an assistant to me, and he said to me afterwards, "It was not half so easy to locate it after I exposed the penis as I supposed it would be."

You must be very careful. I would commence at the superior end. If you find the calculus there, then go very, very carefully, in order to locate it at all. It is not an easy job when it is exposed.

DR. HUGHES: Have you ever passed a catheter or made an endeavor to explore the extreme lower extremity in a bull—by means of a catheter or anything else.

DR. JONES: Not in these cases, nor in any other. Experience has shown me in these cases, when there were swollen and irritated conditions of the urethra, it was sufficient to block the passage of urine without a calculus being there,—what chance has a catheter? Case No. 1 was one of those.

DR. O'NEILL: Did you make an effort to try it?

DR. JONES: No, sir, I just made the statement that it can be done. In some cases it can.

In regard to our medical treatment (which has been spoken of) there was no reason at all in case No. 2, as described in my paper. It was an attempt made on my part to save that calf with the object the owner had in view,—of a show calf; and to see what could be accomplished by the medical treatment. I think, in that case alone, if in no other, our treatment was entirely satisfactory. I think the calculi in that case increased wonderfully. The owner of this calf was a very wealthy man. There was nothing that he would not do in the medical or surgical treatment to save the calf, and as I said, after our treatment, at the end of the year, we found the kidney a veritable sand-bank. How many he passed, I know not. If he passed any considerable number, they were accumulating very, very fast.

Now, undoubtedly, in that calf's first symptoms there were good results, as Dr. Hughes has stated. We got results from February until May. This animal might have passed several during that time, but the finish came later on, as I stated in the paper.

I believe it is useless, after they become affected, to try to prolong life, with any expectation of accomplishing anything valuable. That is, we have accomplished nothing. We simply keep the animal alive, and our results, in the end, I believe are disastrous.

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LOBELINE SULPHATE

G. H. CONN, D. V. M., Prairie Depot, Ohio.

Lobeline is the active principle of Lobelia Inflata or Indian Tobacco; in large doses it is a powerful emetic, but the depression is so great that it is never administered for this action alone.

It stimulates the secretion of the mucus and also the secretion of the bronchi, the pharynx, the stomach and of the intestines. It also has some diuretic properties and is a diaphoretic. Perspiration may occur very soon after its administration. It reduces blood pressure. After the initial symptoms have passed off, the temperature is reduced and there is depression of the muscles generally.

Lobeline is indicated in those gastric conditions in which there is a lack of sufficient secretion, and in those cases of constipation due to lack of intestinal secretion. Also in dry, hard coughs, due to irritation of the throat and bronchi. It is also of use in conditions of the upper air passages which are of a catarrhal nature. It is a general relaxant and may be employed in obstetrics to dilate the rigid os and stimulate tardy labor. It finds its greatest use in the treatment of tetanus combined with tetanus anti-toxin in veterinary medicine. It is also of use in asthmatic affections of the domestic animals and may be of value in relieving strangulated hernia.

Lobeline is best administered to the domestic animals hypodermically, using the sulphate. If you have not the lobeline you can use specific medicine, lobelia prepared by Lloyds or the special hypodermic lobelia of Lloyds which is a non-alcoholic preparation. I have used it in 5 c. c. to 10 c. c. doses in tetanus and have also used the lobeline sulphate and have had very satisfactory results with them.

In canine practice the hypodermic lobelia or the specific medicine lobelia should be used in 15 to 30 minim doses for the same indications that I have given for the larger animals. Never use a fluid extract or a tincture as you will get abscess and other objectionable after effects.

AN EXPLANATION: In order that the editorial statement in the October issue and the statement of ownership, management, etc. on page 268 of the present issue will not appear to be inconsistent, we will explain, that according to the postal authorities, the name and place of publication do not change until an issue under the new name at the new address has actually been mailed; and as Dr. Ellis got out the October issue from the old address, they recognized no change, and requested statement of October 1st to be made as though no change had taken place, although the AMERICAN VETERINARY REVIEW really became the property of the American Veterinary Medical Association on that date. A further explanation of the delay in the receipt of the numbers of the October issue by subscribers, after Dr. Ellis had exeerted every effort to get it out very nearly on time, (even though his work on it did not begin until his return from the Oakland meeting) is that the issue was held up at the post office on a technicality, relative to the change of name.

REPORTS OF CASES

MY FIRST ACTUAL EXPERIENCE WITH FISTULA OF THE EAR.

J. E. STRAYER, Hartington, Neb.

On Sunday, December 18th I received a telephone call to come thirteen miles to see a bad case of distemper (Strangles). The wind was blowing a gale, such as we have in Nebraska occasionally; this interfered materially with the telephone service. The meagre message in formed me that a colt has had the distemper two weeks and has a running sore on the ear. Come at once. On arrival I found a two-year-old colt, draft type, with a fistula half way up the ear, discharging a thick, dirty whitish substance, somewhat resembling the white of an egg. Immediately below the fistula was an enlargement filled with the grumous substance mentioned above. Pressure on this enlargement caused a discharge at the fistula; and just below this enlargement a solid object could be felt, which projected about three-fourths of an inch above the parietal bone. It's outline could be distinctly felt and I had no hesitancy in saying it was a tooth formation.

The parties claimed the colt had this discharge about two weeks, but further inquiry brought out the fact that they had owned the colt two weeks and did not know how long the condition had existed. The original owner was consulted at a later date which brought out the fact that the colt had an enlargement there when he was two weeks old.

The parties were advised to bring the colt to town where he could be placed on the operating table. This they did the next day. The field of operation was shaved, disinfected and cocainized as deeply as possible. A horizontal incision was made, the tissues were removed and this revealed the odontome which was surrounded by a substance macroscopically resembling alveolar periosteum, which adhered very tenaciously to the tooth and parietal bone. The forceps were applied with hopes of removing the periosteum and tooth in toto, but the capsule crumbled under the pressure of the forceps. Several futile attempts at extraction were made and it seemed that the parietal bone was very likely to fracture, but after

a long, continued rotary movement I was able to extract the tooth, which was one and one-half inches long and nine-sixteenths inch in diameter at the crown and gradually tapering to the fangs which were four in number, and about the size of straws. There was just enough space between the fangs so their outlines could be distinctly seen.

The molar had a roughened or carious appearance with a groove running from one fang around the tooth and communicated with the fistula at one point of the crown. This point was as white as it is possible for ivory to be, which proved conclusively that the object was intended for a pre-molar. The outlines resembled the third upper pre-molar. The crown was directed upward, fangs downward and inclined inward toward the petrosal bone. Forty grains of bichloride of mercury were placed in the cavity and held in position by some cotton. The colt was sent home the ninth day apparently not feeling worse as a result of the operation and treatment.

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CARCINOMA OF THE LIVER IN A DOG.

CRITTENDEN ROSS, D. V. M., New York, N. Y.

A dachshund was presented at the office one evening with the history that she had been failing for some time; that she tired very easily when at exercise, that the digestion had been poor and that this time the patient under consideration had had a very severe attack of vomiting. The patient was treated accordingly, but it succumbed before morning. An autopsy was held which revealed the following:—Animal slightly emaciated and anemic, the stomach appeared congested and at points the mucous membrane appeared hemorrhagic, the lungs showed post-mortem stasis and a mucous exudate in the trachea, bronchi and bronchioles. The liver contained a tumorous growth which was sent to Dr. B. F. Kaupp for laboratory examination and who was kind enough to make a photograph of a section of the same as well as a laboratory report, both of which follow.

REPORT OF DR. B. F. KAUPP, PATHOLOGIST: A specimen of the liver of a dog was received at the laboratory from the clinic of Drs. Ellis and Ross 8/10/'15.

The liver contained a tumor measuring 3 cm. x 3 cm. x 4 cm. and appeared lobulated.

The sectioned surface through the center of the tumor ap-

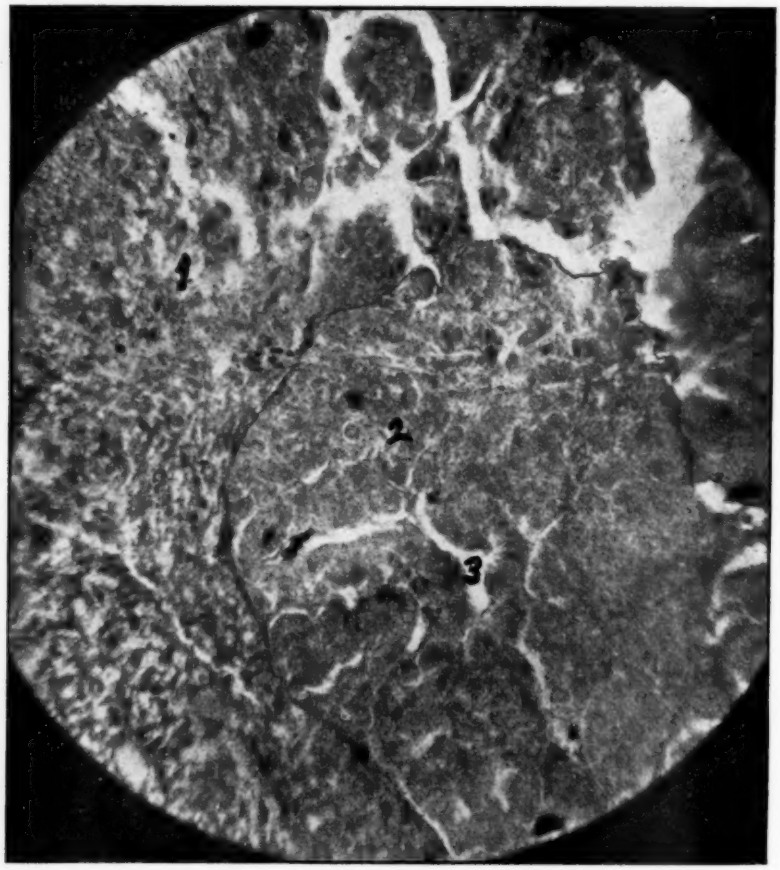

FIG. 2.
1 Normal liver tissue. 2. The tumor cells. 3. Connective tissue.

peared whitish in color and cut as though a small amount of connective tissue was under the knife. The whitish areas appeared to be invading, rather irregularly, the liver tissue and was not incapsulated.

A specimen about one centimeter square at the juncture of the apparently healthy tissue and tumor was prepared and sectioned and stained with hematoxylon and eosin.

The microscopic study showed a carcinoma of the liver. (Figure No. 2-. The study showed the tumor tissue to be throwing out masses of cells protruding and invading new surrounding liver tissue. The cells were typical cancer cells possessing large cells with rather large nuclei containing chromatin granules and were nested in masses in spaces formed by adult type connective tissue.

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CASES OF AZOTURIA AND THEIR TREATMENT.

W. J. CLEVELAND, Havre, Mont.

The first case was a bay mare, weight of 1200 pounds, five years old. The mare had been worked on a plow all day until 5 P. M., when the owner noticed that she began to sweat profusely and hang back. He kept her going until she went down. After he had her unhitched she got up and he took her to the barn, a distance of about one-half mile. When he got her into the barn she went down again and could not arise. I arrived at about 6 o'clock P. M., catheterized her and found the urine coffee colored. I then gave her the treatment as outlined on page 239 of the April number of *Veterinary Medicine* with the exception that I gave the turpentine 1 oz. in an emulsion of olei lini and whites of eggs. I gave it this way to lessen the irritation of the mucous membranes of the digestive tract.

I followed this with aloin, 4 dr.; spts. etheris nit. 2 oz.; chloral 1 oz. in capsule. I made her as comfortable as possible and left her for three hours.

I then gave her turpentine, 1 oz. (in emulsion); spts. etheris nit., 1 oz. Three hours after this I again catheterized her and repeated the last dose. I gave her turpentine 1 oz. every three hours until 8 ounces had been given. Her bowels moved rather freely in the first stages, so I did not give arecoline.

After the 8 ounces turpentine had been given I gave stimulative treatment in the form of nux vomica and alcohol. The mare got up 30 hours after first going down and made an uneventful recovery.

CASE No. 2. Black gelding, weight 1400 pounds. Was noticed to be lagging behind the other horses in the field. This horse was attacked after working all day until about 5 P. M. The owner took the horse to the barn as soon as he noticed the symptoms and had no sooner arrived at the barn when the horse went down and could not get up.

I arrived at 9 P. M., found the gluteal muscles greatly swollen and very hard. I followed the same treatment as in case one with the exception that I used hot packs on the muscles of No. 2. This horse got up after being down 36 hours. He did not recover fully for several days, due to the muscles being so badly swollen.

The other cases were not so bad as the two above mentioned. These being cases in which the muscles became hardened but the horses did not go down.

I gave each of these not to exceed four ounces of turpentine during the first 8 hours. I used stimulative treatment to the affected muscles, and in cases where there was much nervousness I used chloral hydrate in the first stages following with stimulative treatment as in cases one and two.

I have better success with the treatment as outlined in treating azoturia than with any other treatment I ever used. However, I have not used this long enough to say that it never fails. It was gratifying to me for I had, up until this time, tried every thing I could hear of in treating azoturia.

A call has been issued by Assistant Secretary of Agriculture Vrooman for a conference to be held at Chicago, November 29th and 30th to consider ways and means relative to "preparedness" and properly financing campaignes against future visitations of Foot-and-Mouth Disease and to co-ordinate the work of federal and state authorities.

It is expected that the meetings will be attended by state live stock sanitary officials, agricultural college experts, practical stockmen, veterinarians and representatives of various other branches.

ABSTRACTS FROM RECENT LITERATURE

CHRONIC CONTAGIOUS ENTERITIS OF CATTLE

Der infektiose Darmkatarrh des Rindes

PROF. DR. MIESSNER, Hanover.

Tenth International Veterinary Congress, London, 1914.

Chronic contagious enteritis of cattle is termed *bovine paratuberculosis* and the causal organism the *bacillus paratuberculosis bovis.* In cases where it occurs in the sheep the bacillus is called the *bacillus paratuberculosis ovis.*

The paratubercle bacilli were successfully cultivated upon media containing dead acid-fast bacilli or their extracts, by Twort and Ingram in 1910, and subsequently by M'Faydean, Sheather and Edwards, and Holth. Cultivation is possible upon media to which either dead acid-fast bacilli or their glycerine extracts are added.

Paratuberculosis must be considered as a disease *sui generis,* which has nothing to do with tuberculosis.

The bacillus of paratuberculosis is distinct from the tubercle bacillus.

Paratuberculosis may be diagnosed by means of a vaccine prepared by Twort and Ingram from the paratubercle bacillus. In certain cases the bacillus may be searched for in the feces after treatment with anti-formin and centrifugation.

Paratuberculosis is principally a disease of the cowshed.

The causal organism may gain access to the body during the period of suckling. For this reason, as one of the measures to be adopted against the disease, calves should be reared separately, on infected premises. In connection with the dissemination of the disease from animal to animal through the medium of contaminated straw, suspected or diseased animals must be isolated as promptly as possible and their standings thoroughly disinfected.

Immunization by means of dead bacilli should be investigated.

M'Faydean has recorded a case of the disease in a deer.

Paratuberculosis has been found in sheep by Stockman and by M'Faydean, Sheather and Edwards. Sheep and goats have also been successfully infected by inoculation with pure cultures of the paratubercle bacillus.

THE CONTROL OF THE PRODUCTION, DISTRIBUTION AND SALE OF MILK IN THE INTERESTS OF PUBLIC HEALTH.

Le Controle de la Production, de la Récolte, de la Distribution et de la Vente du Lait dans L'Intérét de la Santé publique.

Prof. Ch. Porcher, Lyon.

Tenth International Veterinary Congress, London, 1914.

The author gives an account of the difficulties introduced into the milk question through the intervention of typhoid carriers and the transmission of Mediterranean fever through the medium of milk derived from apparently healthy animals.

To render the work valuable from a prophylactic point of view, these facts must be submitted to a closer examination. The serum test, or the "lacto-reaction," must be carried out upon goats derived from places that are infected with Mediterranean fever.

The hygienist, in order to follow the matter to a logical conclusion, should also carry out serum tests upon the people employed at farms and dairies. In this way it might be possible to eliminate carriers who are responsible for so many important outbreaks of abdominal typhus, originating from contaminated milk.

M. Porcher emphasizes the importance of dirty milk as a cause of infantile mortality. He advocates a very thorough inspection of dairies, including not only the animals, but the premises, water supply, etc.

Finally, he advocates the creation of a complete and homogenous course of instruction regarding milk under a single professor in the veterinary schools.

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THE CONTROL OF CONTAGIOUS EPITHELIOMA IN CHICKENS BY VACCINATION.

Winfred B. Mack and Edward Records.

Bull. No. 82, Ag'l Expt. Sta. of the Univ'y of Nevada, Reno, Nev., June, 1915.

The authors conclude that the etiological identity of roup, avian diphtheria and contagious epithelioma is a subject of controversy which requires further extended research to settle. For that reason it is uncertain whether the cases dealt with in the experiments were caused by pure contagious epithelioma virus or were due to mixed infection.

The use of a virus prepared by triturating the morbid products collected from the skin and mucous surfaces and attenuated at 50°C. for one hour checked the spread of the disease promptly and exercised a favorable influence upon visibly infected birds. Cases thus treated ran a shorter and milder course than those not treated and the mortality was materially reduced.

On the whole, the treatment was found satisfactory and successful. In five flocks no unfavorable results followed the subcutaneous administration of the vaccine, but in two flocks serious toxic and septic processes were apparently caused by it. The crude preparation used is not, therefore, without danger and a more refined product must be devised. However, the conclusion that in this method there is a fairly efficient means of promptly checking outbreaks of contagious epithelioma or the other uncertainly defined diseases, if there is more than one capable of producing similar morbid conditions in fowls, and a therapeutic agent of considerable value, seems warranted. Furthermore, the prevention and control of this disease, or group of diseases, may eventually be placed on a sound, scientific basis seems likely.

FISH.

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THE SEPARATION OF THE ANTI-BODY FRACTIONS IN HOG-CHOLERA SERUM.

FREDERICK EBERSON.

Journ. Infec. Dis. Vol. 17 (1915), p. 339.

This work was attempted in order to find whether it was possible to separate hog cholera serum into active and inactive parts. The experiments were based on the work of Gibson and Banzhof of the Department of Health of New York City on the concentration of diphtheria antitoxin. These workers have shown that artificial concentration is practicable.

As a result of his experiments the author reaches the following conclusions:

"Hog cholera serum can be split up by chemical means into an actively protecting globulin fraction and an inactive albumin fraction.

Precipitation of serum proteins by means of ammonium sul-

phate is practically possible for hog-cholera serum. The bulk of the serum, being inactive albumin, may be dispensed with.

Concentration for practical purposes may be effected (1) by precipitating the euglobulins from diluted serum, by means of 33/1/3 percent saturation with ammonium sulphate solution, filtering, making the filtrate up to 50 percent concentration with ammonium sulphate solution, filtering, and after dialyzing the precipitate in running water, dissolving it in the smallest volume of salt solution; (2) by precipitating the diluted serum (diluted 10–15 times) by one-half saturation with ammonium sulphate (saturated solution), filtering, dialyzing the precipitate, and treating as in (1). Since both globulin constituents are protective, this method would prove more economical and simpler.

Euglobulin represents from 20–21 percent of the total serum protein, pseudoglobulin 0.5 percent, and albumin about 80 percent.''

FITCH.

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CONTAGIOUS ABORTION IN DOMESTICATED ANIMALS.

Ueber das seuchenhafte Verwerfen der Haustiere.

PROF. DR. ZWICK, Vienna.

Tenth International Veterinary Congress, London, 1914.

The contagious abortion of cattle, which has a wide distribution, is caused by Bang's abortion bacillus.

Agglutination and complement-fixation tests are valuable aids in proving the presence of the infections in cattle. On the other hand, precipitin tests and inoculations with abortin have not been found to be of much value.

It is not possible by means of the agglutination and complement-fixation tests to predict the occurrence of abortion.

Under natural conditions infection occurs through the medium of the bull or through the ingestion of infective material. The introduction of infective material into the genital passages from infected straw or discharge plays a very inconsiderable part in the process of infection.

Contagious vaginitis is not considered to be a cause of abortion.

Veterinary police regulations appear to be less suitable for combating the disease than private regulations giving well informed owners information regarding the nature, treatment and prevention of the disease.

Further investigations are necessary in order that a suitable method of immunizing against the disease may be discovered. Special attention should be paid to the question whether it would be possible to carry out immunization of calves and young cattle, so as to confer a degree of immunity which would be of practical value.

Further research is necessary regarding the etiology of contagious abortion in the mare, sheep, goat and pig.

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DOURINE AND THE COMPLEMENT FIXATION TEST.

E. A. Watson, V. S.
Parasitology. Vol. 8 (1915), p. 156.

Dourine is a disease which is assuming more and more importance in the United States. One of the perplexing problems in connection with the disease is diagnosis. The Bureau of Animal Industry has, for some time, used the complement fixation test as an aid in the diagnosis of this affection. Dr. Watson, working at the Veterinary Research Laboratory at Lethbridge, Canada, writes this paper after an experience of 15,000 tests with complement fixation for the diagnosis of this affection. The procedure and technique are given in detail and in a manner readily understood. Among other general remarks in conslusion the author states:

"The successful practice of the complement fixation test depends mainly upon the preparation and use of powerful reagents, their specificity and the accurate determination of their relative values, the fixing of standard doses wherever possible, and a constant, uniform technique and method of procedure.

Close familiarity with the activity of the reagents is essential for the best results.

Stock reagents should be prepared in quantities calculated to meet all requirements for as long a time as the activity of the reagents remains practically constant. Thus: sufficient haemolytic serum for six months' work; antigen to suffice for one month's work; fresh red cell suspension once a week; fresh complement daily or on alternate days, or as needed. It is advisable to use the blood of two sheep for sensitizing rabbits and to use the red cells of the same sheep for the haemolytic system."

In a discussion of some practical questions which arise in the use of this test we find, among others, the following:

"*Can the test be practically applied?* Yes, without doubt, and with as much ease as a mallein or tuberculin test is applied. In the one case blood is collected in the field and sent in for a laboratory test, in the other the reagents are prepared in the laboratory and sent out for a field test. Further, as many retests can be made by the complement fixation method as desired, for no toxins or immunizing substances are injected into the suspected animal to interfere with subsequent diagnostic tests. This test is no longer a new departure in veterinary diagnoses; it is successfully applied in glanders, contagious abortion and in other specific diseases and is yearly coming into more general use.

Is the technique too intricate and laborious? Not more so than many other necessary and accepted laboratory methods, and this is essentially a laboratory test.

What is the percentage of positive reactors in dourine outbreaks? This of course varies according to the length of time the disease has been in existence in a stud or range herd before being checked by preventive measures. In the most extensive outbreak that we have had to deal with 456 positive reactors were found in a total of 2000 animals tested; nearly 23 percent. In an outbreak on an Indian Reservation, 127 animals gave positive reactions out of 1464 tested, or less than 9 per cent. Usually it is between 15 and 20 per cent. Our experience indicates that 100 per cent. of dourine infected animals, whether in active or latent stages of disease, give positive serum reactions, provided that an interval of two to three months has been allowed for an incubation period in the more or less resistant animals, less than one month being sufficient in most cases.

In conclusion, I venture to express absolute confidence in the complement fixation test for dourine as it is now presented, and to claim that apparent failures or discrepancies are due, not to the method itself, but to faulty technique on the part of the operators or of the collectors of the test serum."

FITCH.

PROCEEDINGS OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION

The first business meeting of the combined fifty-first and fifty-second meetings of the American Veterinary Medical Association was called to order by the president, Clarence J. Marshall at 10:30 o'clock A. M.

PRESIDENT MARSHALL: Ladies and Gentlemen:—The time has arrived to call to order the regular fifty-second stated meeting of the American Veterinary Medical Association. The meeting is now in session.

The gentleman who is on the program to deliver the address of welcome, the Honorable Victor H. Metcalf, ex-secretary of the Navy, is sick, but we have another man in his place. It gives me pleasure to introduce to you Mr. H. C. Capwell of the Chamber of Commerce of Oakland, who will deliver the address of welcome.

Mr. Capwell's address of welcome, Dr. Rutherford's response and President Marshall's address were printed in the October number.

PRESIDENT MARSHALL: The next order of business is the roll call. If there is no objection, we will accept the registration at the door—for the regular roll call. The next order of business is reading the minutes of the preceding meeting. What do you wish to have done in reference to the reading of the minutes?

It was voted that the report as published in the proceedings be accepted.

PRESIDENT MARSHALL: If there is no objection, it so ordered. Is there any other business to come before the association?

DR. DALRYMPLE: I understand it has been the custom for years, or at least now that Dr. Alexander Liautard has left the United States and resides in Paris, for him to cablegram his congratulations to this association at its annual meeting. I had a communication from Dr. Liautard a short time ago and he made the statement to me that, owing to the conditions in Europe at the present time, he did not feel like sending his usual cablegram of congratulations, but that he would like to have me deliver his message verbally if I should be at the meeting. Therefore, I take great pleasure in conveying to the association, Dr. Liautard's congratulations and best wishes for the best success of the A. V. M. A.

DR. MAYO: Mr. President: I second that motion and in doing so, I want to state to the association that it was my pleasant privilege to call upon Dr. Liautard last summer and to spend a day with him at his beautiful country home in France,—a most delightful day, and the memories of this association that were presented to us there by Dr. Liautard, I am sure, expressed the intense love and affection which he has for the association and the profession in America.

DR. DALRYMPLE: Mr. President, it seems to me fitting that, even though the Doctor did not send his usual cablegram, this association should extend to him the courtesy of an acknowledgement of his congratulations, and I make a motion to that end. Seconded by Dr. Mayo.

PRESIDENT MARSHALL: It has been moved and seconded that a cablegram be sent from this association to Dr. Liautard. If there is no objection, it is so ordered.

DR. ELLIS: Mr. President: I neglected to bring with me a letter which I received from Dr. Liautard in which he asked me to convey to the association also, his best wishes and congratulations, and I will ask that that letter be allowed to become a part of the minutes of this meeting. I will see that the secretary gets it.

Bois Jerome, 12th of December, 1914.

To the President of the American Veterinary Medical Association,

My dear President and most esteemed friend:

For a few years past, it has been with the greatest pleasure, that I took advantage of the possibility of cabling the association, a few words of friendly souvenirs for all.

Those were always welcome, I knew, by the arrival of the acknowledging thanks in return.

Today, on account of the state of affairs on the Continent and of the doubtful delivery at the proper time of my usual cable, I will not permit that I shall be deprived of my pleasure, nor ignore my duties towards you and all those friends, members of our association, who have gathered in the great city of New Orleans. A Frenchman may be allowed to visit an old French city with a letter.

You will then permit me, my dear President, to ask you to accept my deep regrets of being absent from your great meeting, to present and express to all our friends my warmest friendly souvenirs and to assure all of my sincere wishes for a grand meeting with the continued growth and successful progress of our national Institution.

Frenchman-like, I may be allowed to send in this French city, in days gone, a good and hearty cry of: VIVE L'AMERICAN VETERINARY MEDICAL ASSOCIATION.

Yours very cordially,

A. LIAUTARD.

Although the above letter was written for the New Orlean's meeting which was not held, it nevertheless is expressive of Dr. Liautard's never failing interest in the A. V. M. A. and the veterinary profession in America, and not to publish it in the minutes would leave a missing link in the chain that has bound him to his American confreres whom he has annually supplied since he has been unable to be with us in person.—EDITOR.

PRESIDENT MARSHALL: I will appoint Dr. Dalrymple, Dr. Ellis and Dr. Hoskins to draft that cablegram.

The cablegram so sent by that committee is as follows:

Oakland, Calif.. Aug. 30, 1915.

Prof. A. Liautard:

Bois Jerome, via Vernon, Eure, France,

Warmest thanks. Congratulations.

A. V. M. A.

DR. HARING: I would like to call attention to the new program which has been printed and which should be followed rather than the official program which was mailed to you by Secretary Mayo from Chicago, because changes in

the place of holding meetings became necessary. The meetings this afternoon will be section meetings on the Mezzanine floor. You will note by the new program that the meeting of the Association of Veterinary Faculties and Examining Boards of North America will meet in Room 101; section on Veterinary Practice will meet in the blue room; and the section on Sanitary Science and Police in the northwest room, all on the Mezzanine floor. You will note also that there is a general session this evening which is not noted in the official program, so that in arranging to attend the meetings, please follow the new program,—the large white one with the blue cross printed on the cover. The local committee on arrangements felt that the ladies and our visitors will not wish to be over-burdened with entertainment other than trips to the exposition as that is the great attraction of the San Francisco Bay region at this time. Details will be announced daily concerning our program. To-day, the ladies are asked to meet at one o'clock on the west side of the court, if they care to go to the exposition. At that time certain announcements will be made to them. Mrs. Haring has charge of the arrangements for the trip this afternoon, and if you will be there at one o'clock sharp, details will be arranged at that time for the ladies.

DR. MAYO: I would like to announce that all who have not paid their dues may do so. There is a clerk at the door who will receive your money and give you receipts and membership cards, so please see her rather than myself regarding it as she has all the data there.

PRESIDENT MARSHALL: I believe that finishes the program for the morning. I wish to warn the members to attend the meetings on schedule time. There are many attractions around here, and I fear you will get away at times when you should be here attending the meetings. I hope you will be here promptly. Be sure to attend all the meetings of the session. That is all we have this morning. If there is no objection, we will stand adjourned until two o'clock this afternoon.

Oakland, California, August 30, 1915.

The second business meeting of the fifty-second annual convention of the American Veterinary Medical Association was called to order by President Marshall at 8:00 o'clock P. M.

PRESIDENT MARSHALL: We are already twenty minutes beyond the schedule time for beginning. The secretary tells me there is no unfinished business. The first order of business is the report of the executive committee.

DR. MAYO: The executive committee has reported favorably upon the following applications for membership: (They will be read alphabetically). The list of new members was published in the October number.

The report has taken twenty minutes. It is about half done. Would you prefer to have it finished tonight, or take it up at a future meeting? We have quite a long program for tonight, and Dr. Stange, I see is here prepared to give his report. It is just as you say; we can finish it tonight if you wish.

DR. HOSKINS: I move that we take up the balance at a subsequent session of the association. Seconded by Dr. Kinsley.

PRESIDENT MARSHALL: If there are no objections, it will be so ordered.

It is so ordered. The next subject on the program is the report of the Committee on Intelligence and Education by Dr. C. H. Stange.

DR. STANGE: There are some other papers, I believe, that are to be reported by other members of the committe. I will ask Dr. Moore to present Dr. Fish's paper first.

PRESIDENT MARSHALL: What is Dr. Fish's paper?

DR. STANGE: Upon the Requirements of the Veterinarian, it is a part of the report of the committee.

PRESIDENT MARSHALL: Dr. Baker has a report to make for this committee. Is Dr. Baker in the room?

DR. BAKER: Mr. President, I have jotted down here the few ideas that have come to me on this subject, and I am naturally inclined to dive right into the pith of things without much preliminary waste of "hot air", you might call it. I will give you a few ideas which I have here on the subject of the practical side of veterinary education. According to my ideas this is a very important part of veterinary education, and you will naturally glean from the paper the point I wish to make first in connection with this subject, and that is that hospital practice is as important in the curricula of veterinary education as a diagnostic course. It holds the same relation to a course of theory and practice of medicine as the laboratory does to a course in bacteriology and pathology and the dissecting room in anatomy.

((Dr. Baker's portion of the report was printed in the October number).

PRESIDENT MARSHALL: Gentlemen, if there is no objection, I think it would be well to hear the other portions of the report of the Committee on Education and discuss the papers at one time. If there is no objection to that, I will call on Dr. V. A. Moore to read Dr. Fish's paper.

DR. V. A. MOORE: Mr. President, this paper is entitled "The Requirements for a Veterinarian," by Dr. Fish. (Printed in the October number).

PRESIDENT MARSHALL: Dr. Stange, are there any other papers?

DR. STANGE: Mr. Chairman, members of the American Veterinary Medical Association, gentlemen, at various times in the past your Committee on Intelligence and Education has reported concerning the work that is being done in the several veterinary colleges of the United States and Canada. Inasmuch, however, as the association now has a special committee for the purpose of investigating colleges in the United States and Canada, our work has somewhat overlapped with the work of that committee.

Dr. Stange then read his paper on the subject of Intelligence and Education. (Printed in the October number).

PRESIDENT MARSHALL: The next paper of the Committee on Intelligence and Education is by Dr. DeVine, a member of the committee, to be read by the secretary, Dr. Mayo.

Dr. Mayo then read the paper entitled "Discussion of the Present Methods of Teaching" by Dr. John F. DeVine. (Printed in the October Number).

PRESIDENT MARSHALL: That finishes the report of the Committee on Intelligence and Education. What will you do with that report?

DR. S. STEWART: I am wondering whether we might not at this place call for the report of the special committee on colleges. That report is ready I understand. Let it be a part of this general discussion.

PRESIDENT MARSHALL: Where does that appear in the program

DR. S. STEWART: It comes on Thursday evening, if I remember correctly —perhaps it is Wednesday. Dr. Dunphy of that committee is here and he may have his report and can read it at this time if you so desire.

PRESIDENT MARSHALL: Do you make that in the form of a motion?

DR. S. STEWART: I move that we call for this report at this time. Seconded by Dr. R. C. Moore.

PRESIDENT MARSHALL: Gentlemen, you have heard the motion. What is your pleasure?

DR. KEANE: We have prepared a report of the Committee on Diseases, and if you are going to take up the report of this special committee on the inspection of colleges, we will have to defer this report.

DR. MAYO: I have seen this report of the Committee on Veterinary Colleges and it bears very closely upon the subjects which we have been considering here, and it seems to me that it would be desirable to take it up now while we are on the subject, and finish it up, and that the report of the Committee on Diseases come a little later on, if necessary.

PRESIDENT MARSHALL: Would it not be possible for us to postpone the report of the Committee on Diseases?

DR. DUNPHY: Mr. President, the report is not quite ready. It was to be brought here and submitted to the various members of the committee appointed for the purpose of visiting the different colleges and making an examination of them. The report has been formally presented and submitted to two members of the committee. The other member of the committee, living here in California, has not yet had a chance to visit the different colleges, and his part of the report was submitted to the other members of the committee. I have prepared this report for Dr. Reynolds, who is the chairman of the committee, he not being able to be present, but it was the intention of the committee that Dr. Browning, the third member of the committee, should go over this report, and we should arrange it so that it would be satisfactory to the other members of the committee. Now, this report could be ready tomorrow afternoon, but in the present condition it would not be advisable to submit to the association at this time.

DR. MAYO: Mr. President, in view of this statement, I move that discussion of the report of the Committee on Intelligence and Education be postponed until the report of the other committee is received, and then we can discuss the whole subject at one and the same time. Seconded by Dr. Kinsley.

PRESIDENT MARSHALL: The motion has been made and seconded that the discussion of the report of the Committee on Intelligence and Education be postponed until the report of the Committee on Colleges has been received. Any remarks? If not, those in favor of the motion, make it manifest by saying "aye"; those opposed by the same sign. It is so ordered.

DR. D. M. CAMPBELL: Mr. President, the report of the Committee on Reorganization is ready at this time. I would like to suggest that this report be made now. It will only take a few minutes. In my opinion, it is necessary that it be read at this time in order that the executive committee may have a chance to act upon it and report it back to the association.

PRESIDENT MARSHALL: I think the suggestion of Dr. Campbell is a good one. It will take but a few minutes to read the report and it will give the executive committee time to act. Did you put that in the form of a motion, Dr. Campbell?

DR. CAMPBELL: Yes.

PRESIDENT MARSHALL: If there is no objection, we will call for that report at this time.

DR. CAMPBELL: This report which I present at this time has been gone over at length and is signed by all the members of the committee. It is a sort of compromise and is brought as an amendment to the report submitted by myself at the New York meeting, and I move that it be referred to the executive committee with instructions to report it back to the association at, say, eleven o'clock tomorrow. Seconded by Dr. Kinsley.

PRESIDENT MARSHALL: The motion has been made and seconded that the report of the Committee on Reorganization be referred to the executive committee to be referred back here to the association for full discussion tomorrow morning at eleven o'clock. Any remarks?

DR. KINSLEY: Mr. President, how is the association at large to know what this compromise is? Will that be brought out by the executive committee in the report tomorrow? We have not heard this report; it has not been read. Will the association at large have an opportunity to learn just what this is?

DR. CAMPBELL: I don't think it would be advisable to read the report at this time because the executive committee will undoubtedly see fit to make some changes in it, perhaps to change it all. When they report it back, it will be read to the association at that time, and everyone will have an opportunity to hear it.

DR. KINSLEY: That is what I want to know; I want to hear the report read.

PRESIDENT MARSHALL: Any remarks? All those in favor of the motion as stated, say "aye"; opposed, the same sign. Carried, it is so ordered. The next order of business is the report of the Committee on Diseases: Dr. V. A. Moore is chairman. The members of the committee are Dr. S. H. Gilliland, Dr. A. T. Kinsley, Dr. W. W. Dimock, and Dr. C. M. Haring. Is Dr. Moore present? Are you prepared to make your report now or do you wish some part of the report made by some other member of the committee?

Dr. Moore then read the History and Distribution of Hog-Cholera in America.

REPORT OF THE COMMITTEE ON DISEASES

V. A. Moore Chairman

W. W. Dimock
C. M. Haring
S. H. Gilliland
A. T. Kinsley

Mr. Chairman and Members of the Association:

There has been little of unusual interest relative to the appearance of infectious diseases of domesticated animals during the last two years, with the exception of the outbreak of Foot-and-Mouth Disease in the fall of 1914. The seriousness of this epizootic renders it impracticable for the committee to undertake a discussion of it at this time. As its control and finally its eradication will be accomplished through the efforts of official veterinarians, your committee feels that the Bureau of Animal Industry should at the proper time issue a complete report on the appearance, extent, control and economic significance of the recent outbreak of Foot-and-Mouth Disease, for the benefit of the profession and in a form obtainable by every veterinarian. Although some errors apparently have been made and much criticism expressed regarding the efficiency of the veterinary service in this Herculean task, your committee recommends that this association express its appreciation of the valiant services of the federal and state veterinarians in the eradication of this disease.

Your Committee on Diseases has, as requested by resolution at the New York meeting, centered its efforts in a study of hog cholera, its distribution and control in America. It seemed wise, therefore, that the work of this committee should be restricted to the preparation of this report which it is hoped will be of value to veterinary practitioners and a benefit to the swine industry of the country.

It was not until a comparatively recent date that a knowledge of the symptoms, lesions and means of diagnosing hog cholera gave much assistance to the practitioner. For this reason veterinarians, as a class, were loath to make a diagnosis of cholera, for it forecasted heavy losses from which there seemed to be no escape. At present the situation is changed. An early diagnosis is imperative for, if it is made in time and prophylactic measures taken, the majority of the herd can be saved. This places a heavy responsibility upon the practitioner who should intelligently meet his obligation both

to his client and to the community. There are few, if any, specific infectious diseases of animals that can be more satisfactorily controlled by the veterinarian than hog cholera.

In carrying out its work, the committee divided the subject matter between its members as follows:—The history, distribution and recommendations were assigned to the chairman. The symptoms, morbid anatomy and differential diagnosis to Dr. W. W. Dimock. The etiology and methods of control to Dr. C. M. Haring. Dissemination and prevention, to Dr. A. T. Kinsley. The preparation of anti-hog-cholera serum and methods for using serum and the treatment of sick animals, to Dr. S. H. Gilliland. The committee has tried to make its report as brief as possible, consistent with its purpose. It has refrained from long discussions and presented the essential facts as it sees them relative to the phase of the disease under consideration. The committee has gone over the individual parts very carefully and respectfully submits the papers prepared on the different phases of the subject, and for which the authors alone are responsible, as its complete report.

HISTORY AND DISTRIBUTION OF HOG CHOLERA IN AMERICA

V. A. MOORE, Ithaca, N. Y.

The first appearance of hog cholera in this country, as ascertained by an extensive correspondence by the Bureau of Animal Industry soon after its organization, and so far as we have since been able to learn, occurred in the state of Ohio in 1833. It appeared in South Carolina in 1837 and in Georgia in 1838. In 1840 it was found in Alabama, Florida, Illinois and Indiana; in 1843 in North Carolina and 1844 in New York. The statement is made by Ostertag and also by Hutyra and Marek that hog cholera appeared first in the United States in 1833 and that it was carried to Europe from here. The *Rec. de Med. Vet.*, 1831 contains a statement in reference to the appearance of a disease in France in 1822, that, according to the description given, was hog cholera. Fleming refers to an epizooty among swine in Ireland in 1840. There are also numerous references to disease spreading among swine in Germany and other European countries prior to 1833. The accuracy of the diagnosis of these diseases can not be assured any more

than that of the disease among hogs in Ohio in 1833. All that can be determined is a conclusion drawn from the symptoms and lesions recorded. In 1865 Dr. Budd of England published a very exhaustive article on pig typhoid in which his description of the lesions is quite similar to those found later in cases of hog cholera in this country. In 1875 Professor Axe of London investigated this disease and confirmed the findings of Dr. Budd.

While the fact cannot be proven the evidence is quite as conclusive that hog cholera was imported into the United States from Europe as it is that it was indigenous to America and taken from this country abroad. Whatever its source of origin, after its appearance it spread at first slowly but later with increasing rapidity along the lines of commerce, until it has invaded practically every part of this country where swine raising has become an industry.

For a number of years after hog cholera first appeared in the United States it did not spread rapidly, although the outbreaks gradually increased in number. In the ten years from 1846 to 1855 inclusive, 93 outbreaks were reported and it was during that period that the disease seems to have gained access to many new locations in this country. We refer to these as outbreaks of hog cholera but the diagnosis is not clear in all cases. The literature shows that in earlier years the writings on swine diseases contain a large number of terms such as enteric fever, pig distemper, blue sickness, purples, scarlatina and many others which may or may not have been the disease now known as hog cholera.

In 1858 Dr. George Sutton of Aurora, Indiana, made a report on this disease in which he quotes The Worcester (Mass.) *Spy*, "that many farmers in that city and vicinity are losing their swine by a mysterious and fatal disease known as hog cholera. In the southeastern part of this town it prevails in a greater or less extent upon every farm." He adds that in most cases the disease is traced to Western hogs that have been sold by drivers during the present season and which seemed to have communicated the contagion to the other inmates of the sties in which they have been kept.

In 1861, Dr. Edwin M. Snow of Providence, R. I., contributed a paper on this disease to the United States Department of Agriculture. In 1875, Dr. James Law of Cornell University furnished to the same department a valuable paper setting forth the symptoms and morbid anatomy of intestinal fever in swine. He believed it to be contagious although the specific organism had not

been found. In 1878 the United States Commissioner of Agriculture appointed nine men for a period of two months each to investigate the disease in various localities. In their reports considerable information concerning the symptoms and morbid anatomy that had been formerly described was confirmed. Law showed that it could be transmitted by inoculation and Ditmers described a microorganism which was called *Bacillus suis* and which he believed to be the specific cause of the trouble. Later he described it as a micrococcus. The study of this disease was continued in the Division of Veterinary Science in the Department of Agriculture by Dr. Salmon. Its study was also taken up by certain men in other parts of the country. In 1885 Salmon and Smith announced the discovery of a specific bacterium and described its essential characters and properties. It was called Bacterium of Swine Plague.

In 1886 Dr. Theobold Smith of the Bureau of Animal Industry discovered another bacterial disease of swine. It was found to be identical with the German *Schweineseuche* and due to the same cause. This led Dr. Smith to call it, on account of its identity with the German disease, swine plague and its organism the bacillus of swine plague and to change the name of the disease described in 1885 as swine plague to hog cholera and its organism to the Bacterium* of hog cholera. Dr. Billings of the Nebraska State Agricultural Experiment Station, who was working on swine diseases, was not willing to accept the change in the nomenclature and he continued to write about hog cholera, the disease first described by the Bureau, as swine plague. His writings were widely distributed both in this country and Europe and they are in a large measure responsible for the confusion relative to the nomenclature of these two diseases.

In 1893 Dr. W. H. Welch of Johns Hopkins Medical School and Dr. Clements of Baltimore presented a paper before the International Veterinary Congress in Chicago in which they gave a clear history of the nomenclature of these diseases and in which they adhered to the one of the Bureau of Animal Industry.

In 1903, deSchweinitz and Dorset discovered what they called a disease identical with hog cholera but which they produced with virus that passed through the finest porcelain filters. Subsequent investigations by Dorset, Bolton, McBride and Niles showed that

* The genus *Bacterium* was changed in 1888 to *Bacillus*.

the organism known as the bacillus of hog cholera was not the cause of that disease but when present it was a secondary invader. They did not, however, deny that it possessed pathogenic properties for swine. The correctness of this new conception of the etiology of hog cholera was soon accepted by European investigators.

Soon after the discovery of the filterable virus, it was found that the serum of hogs that had recovered from cholera possessed a certain amount of immunizing power against the disease and that when they were hyperimmunized their serum would produce a temporary passive immunity against the virus. It was also pointed out that if the immunizing serum was used in conjunction with the virus, or the simultaneous method, the pigs became immune for a much longer time. It is this serum, known as the Dorset-Niles serum, together with the use of the virus and serum or the simultaneous method that are now being employed as prophylactics against hog cholera.

Although the fact seems to be proved that the outbreaks of cholera in this country were due to a filterable virus it was believed that *B. suipestifer* (bacillus of hog cholera) was still a more or less important factor in swine diseases. A study of the reports of the investigations of the outbreaks shows that this organism was rarely, if ever, found in the middle West. It was, however, isolated from many outbreaks in the East and its pathogenesis for pigs was clearly established by inoculation and feeding experiments. In order that the disease produced by this bacillus should be differentiated from that of hog cholera and in order that there might be a more differential nomenclature of swine diseases, the United States Live Stock Sanitary Association appointed, in 1910, a committee of five to report on the nomenclature and classification of swine diseases. After carefully considering this subject the committee reported at the meeting of the association in 1911, that the name hog cholera should be given to the infectious communicable disease of swine occurring in epizootics caused by the filterable viruses; that the name *Salmonellosis* should be given to the disease caused by *B. suipestifer* (bacillus of hog cholera) and that swine plague should remain as the name of the infectious disease of hogs occurring sporadically or in epizootics are due to *Bacterium suisepticus* (bacillus of swine plague). The report was adopted. While this nomenclature may not be the best, and while it has been adversely criticised, its justification rests in the fact that the diseases are distin-

guished by their etiology, which seems to be the one biological basis for classifying the specific infectious diseases.

There is a voluminous literature on hog cholera and many differences of opinion exist concerning it. The findings, however, are tending to the conclusion that hog cholera caused by filterable virus constitutes the greater number of the serious outbreaks among swine in this country, and that *B. suipestifer* and *Bact. suisepticus* are the causes of less serious epizootics or more sporadic diseases. The frequency of mixed infections has undoubtedly been the cause of confusion in arriving at a clear understanding of the *symptom complex* of this disease.

DISTRIBUTION. Without going into details it can be stated that hog cholera exists to a greater or less extent in every hog raising state in the Union. It is much more prevalent in those sections where hog raising is an important industry and where naturally there is more interchange of animals for breeding and other purposes. In Canada it is reported not to be common except in certain restricted areas. In those sections of the country where it is less prevalent it is found most frequently in garbage fed herds about large and small cities. The results of definite experimental work have shown that the probable source of infection in the garbage is the scraps of raw pork that come from hogs which were infected at the time of slaughter but which did not show lesions sufficiently to cause their condemnation. It is, generally speaking, a wide spread disease and it is gradually extending to uninfected places.

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SYMPTONS, LESIONS AND DIFFERENTIAL DIAGNOSIS

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Symptoms. The fact that hog cholera makes its appearance in various forms, in different individuals, in different herds and different outbreaks, makes it difficult to discuss with any degree of positiveness the symptoms that may be shown under field conditions. If we are thinking of hog cholera in the acute form where there is little or no secondary infection, then we have a typical acute specific infectious fever, the first symptoms of which are fever and a rise in temperature. The rise in temperature is often found to be present before the animal shows signs of being sick—in fact in the more acute cases the animal may die and the owner or attendant will not have observed any previous symptoms of ill health. In those that live long enough to show clinical symptoms, we often first notice that the general appearance of the animal is not normal, or that there is a general depression. A closer examination of such animals will show that there is a congestion of the mucosa of the eye, and the temperature will be found to be from 104°–109°. The congestion of the mucous membrane of the eye results in considerable exudation of a sero-mucus or sero-purulent exudate of a sticky character that tends to accumulate on the surrounding parts of the

eye, and often fastens the lids together. When feed is offered, the animal comes up to the trough slowly and leaves before the others have finished. There is a marked tendency to stand off alone, appearing generally dull; constipation is not uncommon at this stage although in some outbreaks of cholera, diarrhoea may be one of the first symptoms reported by the owner. The pigs are often thirsty and will drink water or swill, but refuse to take solid food. The general condition of dullness increases and the animal refuses to come out from the straw. The ears hang down, the tail is straight and there is more or less evidence of weakness, especially noticed in the hind quarters. The animals will stagger when walking or weave slightly when standing. At this stage diarrhoea is usually marked, the discharges being of a dirty gray or greenish color, and frequently contains masses or strings of mucus or of a fixed exudate. However, it should be remembered that the color and consistency of the feces depends to quite an extent upon the character of the food. The discoloration of the skin over the ventral surface of the body extending up around the neck, ears and nose, and down the inside of the legs, is in many outbreaks a rather prominent symptom. The color of the skin in such cases is of a bluish red, and is due to congestion and infiltration of the blood in these parts. This condition is most noticeable on white pigs. The reddish rusty spots frequently noticed on the underside of the body seem to be the accumulation of some secretion from the skin, and by many are considered a very sugestive symptom or indication of cholera. These masses are usually about the size of a pinhead or possibly a little larger, and the skin immediately surrounding may be slightly congested. The collection of urine in the sheath and the consequent dilation, are by some considered quite characteristic of cholera. It would seem to me from the pathology of the cyst formation that the condition has existed for a longer time than the cholera. No doubt, however, this condition is materially aggravated from the presence of cholera and the resulting congestion of the membrane and condition of the urine. Symptoms suggesting changes in the central nervous system, are usually not noticed, but when present they are in the form of convulsions, or there may be a very marked depression which might equally come from the general weakness of the body. The enlargement of some of the superficial lymph glands of the body, especially the inguinal, while not in itself characteristic, can well be mentioned as one of a chain of

symptoms. Congestion of the respiratory mucous membrane is practically always present, but is a difficult condition for which to examine. In young pigs stomatitis, especially the ulcerative or necrotic form is frequently met with in company with cholera, but it is also found in pigs that are known to be free from hog cholera, and should not be given a prominent place in the possible symptoms. Pigs with hog cholera often cough. Coughing may indicate irritation or inflammation of the respiratory mucous membrane, pneumonia, pleurisy, lung worms or stomach worms, therefore, while suggestive of cholera, is in no way positive. In the chronic cases the animals become emaciated, the abdomen is drawn up, the back arched, and the gait is usually very unsteady. In moving a bunch of pigs from the straw to the open for examination, we should always be careful not to excite them as the weaving or unsteady gait is very noticeable when the animal moves quietly, but under excitement it cannot always be detected. In those pigs that still have considerable vitality, I have often noticed a very peculiar gait, marked especially by the way they pick up their feet, the movements of the legs and the feet being short and choppy, with a slight indication of uncertainty. The squeal of a large percentage of pigs in which the disease takes on a subacute form, is a hoarse, sharp, weak cry that lacks tone and force.

LESIONS. In order to systematically discuss those pathological changes that occur in the organs of the pig as a result of the disease that we know as hog cholera, it will be necessary to understand that we use the term hog cholera to designate the disease of pigs which is caused by the filterable virus—thinking of what we know as the filterable virus as a specific morbific agent regardless of what research may ultimately demonstrate it to be morphologically or where systematic biologists may place it in the kingdom of living things.

The disease, as met in the field under natural conditions, is so frequently accompanied by various secondary or mixed infections that it is necessary to take into consideration, both in the diagnosis and prognosis, those tissue changes that result from this mixed infection. In my opinion all other forms of disease or lesions resulting from whatever cause, no matter how closely, clinically or pathologically, they may resemble cholera, unless directly or indirectly due to the action of the filterable virus, should not be con-

sidered under hog cholera; except in connection with the differential diagnosis. This, on the basis that:

> Hog Cholera is a specific, infectious disease of pigs. It conforms to the generally accepted attitude towards the other specific infectious diseases of animals—to classify them according to their etiology.

In the diagnosis of the infectious fevers of pigs, we first of all look for characteristic virus lesions or by inoculation, demonstrate the virus infection. If found to be present we say hog cholera, and handle the infected herd as a virus cholera herd, regardless of the amount of secondary or mixed infection or character of the lesions.

If we fail to find characteristic virus lesions or to otherwise demonstrate its presence, we would not under any circumstances call the disease hog cholera.

Our anti-hog cholera serum is only preventive against virus cholera and that in itself, makes it almost imperative to the practitioners and those engaged in serum production to use a term that is limited in its meaning.

That form of disease due to the virus plus the secondary infection which is found in the majority of cases as met with in the field, is what has always been understood both by the veterinary profession and the stockmen of the country, as hog cholera.

It is the most prevalent, fatal, wide-spread contagious disease of pigs in this country, and is more serious and of greater economic importance than all other conditions found in pigs that clinically or otherwise resemble the results of virus infection.

At least the disease caused by the so-called filterable virus should be designated by some term, the meaning of which is limited to the action or presence of the virus.

In discussing the morbid anatomy of hog cholera, I shall take up first the lesions that occur in the tissues of the animals that are affected with the virus alone, uncomplicated. The observations that we have been able to make, and the reports from others who are working on this disease go to show that the hog cholera virus produces three general pathological changes in the tissues of the animals affected, that stand out as prominent characters of the disease. These changes are congestion, degeneration and hemorrhages. I will take up the discussion of these changes in the order mentioned.

Congestion is practically always present, to a greater or less

degree, in one or more organs of the body, but is not a very important pathological change in hog cholera, so far as the diagnosis is concerned, except possibly as found in the lymph glands of the body, mucous membrane of the eyes and the skin on the ventral surface. On post mortem examination, congestion is found to be present in a marked or mild form in the respiratory mucous membrane, the lungs and the brain and its membrane. The spleen, liver, kidneys and bladder usually show evidences of congestion, in some cases of a very mild character, while in others the organs are uniformly and extensively congested. The stomach and intestine (in some cases) may fail to show any gross evidence of congestion, while in other cases the congestion may be marked, especially in the stomach and large intestine. However, the fact that in some typical cases of cholera the intestinal mucosa is free from gross evidences of congestion, would seem to suggest that some secondary factors are necessary to make the change sufficiently extensive to be recognized on gross examination. The lymph glands, especially the submaxillary, mesenteric, inguinal and mediastinal are, as a rule, enlarged and juicy. The congestion is first noticed in the capsule showing as a bright red line, often at first confined to one portion, later extending all around the gland. It is always first evident in the connective tissue structures and in many instances presents a very striking and almost beautiful picture—the very bright blood-red lines following the capsule and trabeculae with the lighter central portion of a dull gray color. Later the whole substance of the gland may become infiltrated with blood, producing a general hemorrhage, or the hemorrhages may remain separate and distinct. In cases where the lymph glands show degeneration or suppuration evidence of secondary infection is usually marked.

Congestion of the skin in hog cholera is confined to the ventral surface of the body extending down on the inner side of the legs; up the sides of the neck, nose and back of the ears.

Degeneration. The degeneration appears in the form of cloudy swelling or granular degeneration and is found to be most pronounced in the kidneys, liver and spleen. From the examination of a large number of kidneys, both gross and by microscopic sections, we feel safe in saying that degeneration is a marked and characteristic change as met with in the kidneys. Upon gross examination the organ is usually some what enlarged and presents the following general variations: normal in appearance, congested in

areas or uniformly, normal in color and hemorrhagic, congested and hemorrhagic, uniformly pale, so-called cooked kidney, or it may be pale and hemorrhagic, in which case the petechial hemorrhages are very plainly seen because of the contrast in colors. In some cases of chronic cholera and from pigs that seem to possess a certain degree of resistance to the virus we get an interstitial nephritis. In such cases the capsule is more or less adherent, "strips with difficulty" and the kidney is of a grayish brown color.

Upon section we find in the early stages that the tubular epithelium is swollen so that the lumen of the tubule is obscured. The cell protoplasm becomes decidedly granular, the cell membrane ruptures, the nucleus undergoes disintegration and the whole becomes a granular mass in the lumen of the tubule. All the parenchymatous structures of the kidney may be involved but the degree of degeneration shown in sections depends upon the character and duration of the disease. From our observations it would seem that the basement membrane is rarely involved and probably only when we have an interstitial nephritis, which is a secondary lesion. The so-called trachoma bodies found in the various cells of the body, especially from the eye discharges and the kidney cells, are rather constant changes, but they are also sometimes found in healthy pigs and therefore, cannot be considered characteristic of hog cholera. The degeneration of the mucosa of the intestinal tract, especially in the caecum and colon, is an important change, for while not easily demonstrated, the secondary changes that are made possible from the structural and functional disturbances that result in some cases in a complete cessation of the normal function of this membrane, thus allowing micro-organisms to multiply in the membrane itself, or pass through and be carried to other organs of the body, producing changes that are fatal even though the animal naturally or artificially overcomes the virus. The degeneration of the other parenchymatous organs of the body is a typical granular degeneration, the degree and extent of which, seems to depend upon the severity of the case and the amount of secondary infection. This is especially true of the liver and spleen.

Congestion and degeneration are changes that are characteristic of practically all our specific infectious fevers and while they are exceedingly important in our interpretation of the action and importance of the virus, when we come to make a diagnosis of hog cholera, like the inflammatory changes met with that are due to secondary infection, they serve only in a supplementary way.

The hemorrhages which are exceedingly characteristic of virus infection are what we know as petechial hemorrhages and are found in the great majority of cases to be present in the kidneys, lungs, mucous membrane of the bladder, pharynx, large intestine, lymph glands, stomach, brain and in the skin on the ventral surface of the body. The cause of the hemorrhages is the degeneration of the parenchymatous cells and structures surrounding the capillaries, increased pressure from the congestion that is present and no doubt from a direct action of the virus on the wall of the blood vessel. The visible petechial hemorrhages on the kidneys are just beneath the surface of the organs and in typical cases are readily seen, especially after removal of the capsule. Upon gross or microscopic section, they are often found in the golmeruli, throughout the cortex and medullary portions in the intestinal structures and in the pelvis. In some severe cases, our observations would indicate that the hemorrhages may be found generally distributed throughout all of the structures of the kidney. In the lungs the hemorrhages are often situated beneath the serous covering, but microscopic examination shows the finer capillaries throughout the substance of the lungs to be ruptured, allowing the blood to escape in the air sacs and alveolar spaces, and interstitial structures. Hemorrhages are often visible on the mucous surface of the bladder, large intestine and stomach, and are found to be quite frequently present in the submucosa, but so far as our observations go, are never found in the serosa of the intestine, except when secondary infection is evident in the body. The circulatory disturbances noticed in the skin, are most frequently in the form of an infiltration of blood, but a close examination will show that many of the capillaries are ruptured, and that a true hemorrhage existed. The other organs of the body do not, as a rule, upon gross examination, reveal the presence of hemorrhages, yet in some cases small hemorrhages and bloody infiltration may be found in the substance of the liver, heart, brain and possibly other organs of the body.

In young pigs, especially those under six weeks of age, we frequently find numerous petechial hemorrhages showing on the liver and heart. I feel that the hemorrhages found on the heart and liver in young pigs, are directly due to the action of the virus, while hemorrhages on the heart and its membrane and the serous surface of the intestine, in older animals is practically always due to some form of secondary infection, and it seems to me that this is

perfectly logical, not only from our pathological and histological study of the affected parts, but by taking into consideration the delicate condition of the capillaries and supporting structures in these organs of the young pig. The spleen sometimes shows subcapsular hemorrhages, and histological examination frequently shows the substance of the organs to be generally hemorrhagic in character, dark and friable, and often showing the anemic infracts. We do not consider the small subcapsular capillary hemorrhages to be absolutely characteristic of hog cholera, nor are the other changes in the spleen constant, yet while not constant are present in the majority of cases.

While it has become generally accepted and we feel perfectly justified in saying that the hog cholera virus alone or in itself never produces inflammatory processes, but that all inflammatory processes met with in pigs affected with the filterable virus are those due to the action of some other agent, but as the cases of hog cholera met with in the field do in the majority of cases suffer from secondary or mixed infection, and the resulting lesions being more or less constant and uniform in character, we have come to accept them as being sufficiently characteristic of hog cholera as to warrant our using them in making a diagnosis. The typical button ulcers of the cecum and colon, are good examples, but we feel that the virus in producing, first a congestion, degeneration or hemorrhage in the mucous membrane of the intestines, enable other micro-organisms to get a foot-hold, and the tissue changes that result in the formation of the typical hog cholera ulcers, is simply an inflammatory reaction of the tissues in an attempt to protect itself from the destructive action of the organisms and prevent a rupture of the intestine. At other times inflammation met with in the alimentary tract may be an acute inflammation with little or no exudation or destruction of tissue. There is more often in such cases a mucous exudate that has a sticky, greasy character, often blood stained, especially in the stomach. Again the inflammatory changes in the intestines take on the form of a diphtheritic enteritis. This may be in the ileum, cecum or colon, but is usually confined to one portion or the other in pigs of the same herd. In all such cases there is complete degeneration of the mucosa, and involvment of the whole intestinal wall in inflammatory changes. The interlobular hepatitis, intralobular multiple abcess formations so frequently found in microscopic sections, the enlarged, dark, friable spleen and the in-

terstitial nephritis, is due so far as we can determine, to a secondary infection that gains entrance to the system through the intestinal tract. The various inflammatory changes in the lung which range from a simple inflammation to a suppurative necrotic pneumonia, are due to micro-organisms whose entrance to the lungs has been made possible from the fact that the virus has so weakened the natural corporeal resistance and that of the lung itself, to those organisms that normally live on the respiratory mucous membrane or that are inhaled with the dust and dirt of the air, that the lungs are no longer able to throw them off, and through their lodgement in the substance of the lungs, they produce the various degrees of inflammation mentioned above. Atelectasis of the lungs, both natural and acquired, is rather common in the pig, and should not be mistaken for inflammatory changes.

The dark discoloration of the bone marrow which formally occupied a prominent place in the lesions of hog cholera, is found to be rather rare, especially in young pigs with an acute form of the disease, and we are inclined to feel that the changes in the bone marrow should be considered to be due largely to secondary infection, and in chronic cholera, in older animals. An anemic condition of the bone marrow which has been unofficially reported, we have failed to find. A slight or marked increase in the amount of intraperitoneal fluid is rather constant, a fibrous exudate or hemorrhages on the peritoneum is evidence of secondary infection. In the few cases where we have examined the urine from virus pigs about 60 to 75% gave a strong reaction to albumin.

Differential Diagnosis. In that there are many diseased conditions of pigs that more or less closely resemble in their clinical manifestations, hog cholera, it becomes necessary to take them into consideration when making a diagnosis. This is further necessary because many pigs that die of hog cholera fail to show the characteristic lesions.

Among the diseases or disease conditions that must be differentiated from hog cholera, are parasitism, a form of infectious enteritis, that condition which the U. S. Bureau of Animal Industry calls Salmonellosis and is supposed to be due to the *Bacillus suipestifer,* the so-called swine plague, pneumonia, verminous pneumonia, brine poisoning, acute pericarditis, shoat typhoid, enteritis and poisoning from spoiled foods, soap powders and irritating stock powders, swine erysipelas (which so far as we know does not

exist in this country), septicemia, malignant edema, necrotic laryngitis, anthrax, heat stroke, lightning stroke, or sudden death from any cause, and a number of acute febrile conditions, that we have met with in pigs, but so far have been unable to classify.

In the differential diagnosis of any disease we must always take into consideration the history of the affected herd, and then take those diseased conditions that it is possible to recognize, and by a process of elimination attempt to determine what one of the various diseases it might be that is causing the death of the animals. In order to do this, we must of necessity know, and be able to recognize those things that are considered specific characters of the various diseases or diseased conditions met with in pigs.

The diagnosis of hog cholera is made possible by finding in the various organs of the dead animals those lesions that are known to be characteristic of virus infection, or by inoculating a susceptible pig with the blood from a suspected case and the production of the disease. In case the suspected blood is from a pig that showed marked evidence of a mixed infection, or inflammatory changes, the blood should first be filtered. Animal inoculation is further made necessary from the fact that many of the pigs that die of hog cholera fail to show the characteristic lesions, but as it is often impossible, especially in the field, to make animal inoculation, and as we cannot always afford to wait for the result of animal inoculation, it becomes necessary for us to take into consideration and use those things that we know regarding the differential diagnosis.

In cases of parasitism, we look for the presence of the parasite, but we must know the importance of the parasites which we find and their disease producing characters.

In all forms of enteritis we must take into consideration the conditions under which the pigs have been kept, the food and the water supply, the location and character of the lesions in the alimentary tract, the changes found in other organs of the body and the general character of the lesions as a whole.

In what is apparently an infectious enteritis in which emaciation is the characteristic symptom and enteritis and atrophy of the liver the principle gross tissue changes.

If we admit that there is a specific infectious disease of pigs known as swine plague caused by the *Bacillus suisepticus,* then we must demonstrate the presence of the specific organism.

In verminous pneumonia, we will find the *Strongylus paradoxus.*

In all of the forms of inflammation of the lungs, we must be guided by the history of the disease, number of animals affected and the general character of the lesions.

In brine poisoning we practically always can get a history that the animal had access to large quantities of salt. I wish to emphasize this because I personally know that there are many so-called stock foods on the market that contain sufficient quantities of salt, that when left constantly before the animals in solution will produce acute brine poisoning, and we know of a number of cases where a farmer has emptied his pork or beef barrels where the animals had access to it, that resulted in their death.

Poisoning from various causes has been demonstrated a number of times in this country, and we must depend upon the history together with the absence of any specific infection.

In anthrax and malignant edema, we would look for characteristic lesions and the specific cause.

In general septicemia the post mortem findings, together with the history will usually enable us to make a diagnosis.

In necrotic laryngitis the symptoms and lesions are usually sufficiently pronounced to enable us to recognize the condition.

In order to intelligently carry out all the steps that come in in the process of making a differential diagnosis, a man must first be more or less familiar with the predominating features of the various conditions that may be met with in pigs. He must be familiar with the disease in the community in which he is working and be able from the observations and things that he finds at the time of the examination to reason out for himself those things that are necessary to confirm the diagnosis.

In our discussions on the pathology of hog cholera, we attempted to emphasize the fact that the three main pathological changes that occur in pigs as a result of infection with the so-called hog cholera virus are congestion, degeneration and hemorrhages.

If we wish to make a diagnosis from the gross changes found upon post mortem examination, we should look for congestion in the lymph glands, spleen, stomach and intestine, respiratory mucous membrane, mucosa of the bladder and the brain and its membrane.

The degenerative changes which may be found will be a cloudy swelling of the kidneys, such kidneys are usually very pale in color and the organ may or may not show hemorrhages. The degenerative changes found in the other parenchymatous organs of the body

can usually not be detected with certainty upon gross examination. The formation of small or large ulcers in the intestine, especially in the cecum and colon are considered characteristic of cholera, especially the so-called button ulcers. A general diphtheritic inflammation of the small and large intestines does not necessarily come from cholera infection. The degenerative changes met with in the lungs are often found in simple cases of pneumonia and can in no way be considered typical of cholera; however, we should not overlook the fact that during the fall and winter, pneumonia more often accompanies cholera than it does in the late spring and summer.

The typical petechial hemorrhages of hog cholera are found just beneath the pleural covering of the lung, in the kidneys, in the mucosa of the bladder, cecum and colon, sometimes in the stomach, and the mucous membrane of the pharynx. The spleen and lymph glands are often hemorrhagic and the connective tissue structures of the brain frequently show hemorrhagic infiltration. In young pigs of three, six or eight weeks of age, the liver sometimes shows numerous small hemorrhages, but we seldom find these in older animals. In a few cases where we have found petechial hemorrhages on the heart and its membrane there has always been marked evidences of secondary infection. If one is to make a diagnosis of hog cholera from the gross findings at the time of autopsy, I feel that he should find at least two lesions that are considered typical of hog cholera, but that one should be careful in using for diagnosis lesions that may result from a great variety of causes. We consider numerous small hemorrhages on the lungs, kidneys and mucosa of the bladder as characteristic hemorrhages from hog cholera. Any one of these with involvement of the lymph glands or formation of ulcers in the intestines are sufficient to make a diagnosis of hog cholera. Experience has shown that after having made a diagnosis of hog cholera, that one should be very careful to estimate the general condition of the herd and the form of cholera, and especially the degenerative changes, such as pneumonia and ulcers of the intestine, largely due to secondary infection as such animals often fail to show sufficient temperature to exclude them from vaccination, yet the lesions may be of such an advanced character that should they overcome the action of the virus the animals would die from other causes.

THE ETIOLOGY OF HOG CHOLERA

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Although the specific cause of hog cholera has not been seen or cultivated in cultures, much is known concerning its nature and attributes.

DISTRIBUTION OF THE VIRUS. So far as known the virus of hog cholera exists only in the tissues and excretions of infected hogs and in substances which may have been directly or indirectly contaminated. There is no evidence that the virus has the power to propagate itself outside of the tissues of swine. In infected swine the virus is present in the circulating blood and lymph, in all the organs, muscles and vascular tissues of the bones. It may escape from the body in the urine, feces, saliva, nasal anl larchymal secretions and from pustules of the skin.

FILTERABILITY OF THE VIRUS. The blood, tissue juices and excretions of infected hogs are capable of transmitting the disease, even after having passed through filters which remove all known bacteria. The resulting filtrate may be free from living organisms so far as our present cultural and microscopic methods can determine and still be capable of producing hog cholera when administered to susceptible animals.[5 9 12 55] The virus of hog cholera is evidently corpuscular in nature since it will not pass through the finest Kitisato filters, although when diluted it is not retained by the porcelain Pasteur-Chamberland filter candles F and B.[39] The virus will pass even more readily through the Bergefeld filter. However, this kind of filter may occasionally permit *Bacillus suipestifer* and other bacteria to pass.[35 36] In all filtering the pores of the candles usually become more or less clogged and finally the passage of the disease producing virus may be completely prevented. To obviate this as much as possible blood virus should be diluted before filtering, at least 1 to 10, and it is better to begin with coarse filtration through sand, filter paper, infusorial earth and asbestos. In filtering hog cholera virus through fine porcelain filters, its potency per volume is weakened so that a larger dose of filtered virus is required to produce acute hog cholera. Evidently something is removed which has considerable to do with producing hog cholera. Undoubtedly much of the potent virus material is retained in the substance of the filter. It has been observed that the protective

power of anti-hog-cholera serum is greater against filtered than unfiltered virus. This weakening by filtration is supposed by some to be due to the removal of bacteria which, as a secondary cause, may act as an adjuvant to the filterable virus.

PROPAGATION OF VIRUS. So far as we know, the only method for the propagation of virus is by the infection of swine. This is accomplished through the exposure of susceptible swine by inoculation, the feeding of virus, by the infection produced in susceptible swine, by placing them in infected feed lots or exposure pens and by association with infected hogs. Subscutaneous injections of ½ c. c. or more of defibrinated filtered or unfiltered blood, usually produce hog cholera after an incubation of 5 to 14 days. In some instances the period of incubation may be even more prolonged. Swine are the only domesticated animals that are susceptible to hog cholera and numerous attempts to propagate the virus by the inoculation of horses and other animals have failed.

The attempted cultivation of the virus by the use of artificial media has thus far failed.[51] The statement of Pfeiler and Lentz[48] who claimed its apparently successful cultivation has not been substantiated. The propogation of the virus on a cheap medium would be of enormous economic importance in the preparation of immune serum and, in view of the reported successful cultivation of the filterable virus of rinderpest by Boynton, efforts along this line would seem worth trying with hog cholera.

Efforts to concentrate the virus by centrifugalization or by prolonged standing and sedimentation have failed to produce practical results. When defibrinated blood is centrifuged and the resulting sedimented corpuscles repeatedly washed until free from serum, they have been found to be rich in virus. This, however, is probably in part due to the adhesion of the virus to the corpuscles, since it has been demonstrated that the same results can be obtained by adding sheep or rabbit corpuscles to corpuscle-free hog virus and centrifuging. With the use of agar coated filters or other colloid filters, the virus is retained and is deposited to a certain extent in the outer layers of the medium.[2 39]

By injecting physiological salt solution in the proportion of about 25 c. c. per pound of body weight into the abdominal cavity of infected pigs, five to seven hours before they are to be killed for virus, and drawing off what is unabsorbed after the animal has been bled, a fluid rich in virus may be obtained. Certain manufac-

turers of serum have successfully used this salt solution virus for hyperimmunizing purposes.[7 51]

Although the preparation of virus for hyperimmunizing purposes has been limited to the use of blood and salt solution already mentioned, virulent material for experimental purposes has been prepared from infected tissues by macerating the ground-up organs in an equal weight of physiological salt solution after which the liquid is pressed out and filtered.

The urine of infected hogs is rich in virus and although unsuited for hyperimmunizing may be utilized for infection experiments. It is more easily filtered than blood serum.

The bile of infected hogs contains the virus but can only be filtered in a very diluted condition.

The feces contain a relatively small amount of virus. This is probably due to the destruction of the filterable virus by the products of fermentive and putrefactive bacteria in the intestinal tract.[55 56 57]

Virulence of the Virus. It is a matter of common knowledge with those who have tested hog cholera virus in connection with serum manufacture that there is great variation in the course of hog cholera in pigs following the injection of virulent blood. Doubtless in many instances this is due to variations in the individual resistance of the pigs inoculated. Variation in virulence, however, seems to be a marked characteristic of the filterable viruses. In rabies it has been possible by repeated inoculations to enhance the pathogenic power for rabbits to a maximum at which it remains fixed and constant. Attempts to accomplish this with hog cholera virus, although attended with some increase in virulence, and the establishment of a so-called fixed strain,[50] have not resulted in a standard fixed virus for hog cholera which is at all comparable to the fixed virus of rabies.[23 39 57]

It has been demonstrated that hog cholera serum made from one strain of virus will protect against other strains of virus. However, there is reason to believe that serum made from a virus of low potency is less efficient than that made from strains of high virulence. The variation in virulence of epidemics in various parts of the country can be accounted for largely as a direct variation in the virulence of the filterable virus. Craig[7] states that strains of virus of low potency can be enhanced in virulence by passage through 2 to 6 weeks old pigs from susceptible mothers. One of

the strongest theoretical arguments against the simultaneous method is that the distribution of highly potent laboratory virus tends to keep hog cholera infection enhanced to its highest point of virulence. Hog cholera epidemics diminish in virulence when new virus is not introduced, but there is a difference of opinion among authorities concerning the use of virus and the restrictions which are desirable in connection with its field use as an immune agent. The view held by some pathologists is that pure uncomplicated hog cholera is itself a relatively mild disease which derives its malignancy from the bacterial infections which follow in the wake of the primary infection with the true filterable virus of the disease. The claim of Dinwiddie[11] that certain strains of cholera virus, even when bacilli are absent from the injected blood, seem to quite generally beget bacillary infection by inoculation and that the same effect is produced by exposure infection with these strains. When unfiltered virus is used there is always the possibility of the presence of pathogenic bacteria. The practice of drawing the virus blood in the early stages of the disease and its preservation with 1% phenol, does much to eliminate bacterial contamination.

A little data concerning the comparative virulence of various strains of filtered bacteria-free hog cholera virus is available. The minimum fatal dose has not been determined and doubtless the virulence of the virus, even when so-called fixed strains are used, is so variable that it would be impossible to determine the fixed minimum.

Action of the Virus in Vivo. Lacking definite knowledge of the specific pathogenic organism causing hog cholera, the method of its harmful action on the body cannot be definitely determined. It is now generally supposed that the filterable virus weakens the resisting powers of the body, and that semi-pathogenic bacteria, particularly those of the colon, paracolon, typhoid groups invade the tissues and render the disease more malignant. A description of the pathological changes produced is given by Dimock in another section of this report. The virus is harmless for all domesticated animals except swine. The injection of considerable quantities of virulent blood into horses produces some reaction. It is probable that soluble toxins do not play a very important part in the action of the virus.

The action of the virus on the endothelial cells is evidenced by the characteristic petechial hemorrhages throughout the body. The

skin lesions are doubtless indications of a trophic affinity of the invisible organism or its products for the epithelial cells. The purulent conjunctivits and the peculiar cell inclusions which we describe later in the conjunctival epithelial cells are perhaps manifestations of a specific action on these tissues. In most of the lesions of hog cholera, particularly those of an extensive character, doubtless secondary bacterial infection plays the most important part, but the primary injury at the points where the lesions form is probably due directly to the virus. As to just how this injury occurs is at present a matter of surmise.

Infection with the filterable virus of rabies, variola, epithelioma contagiosum, and trachoma is accompanied by intracellular changes in certain groups of cells and the presence of inclusions similar to those of trachoma in the conjunctival cells of hogs infected with cholera is probably of significance as an indication of the affinity of the virus for such cells.

CHLAMYDOZOA OR STRYNGOPLASMA.[34 49] In the conjunctival epithelial cells of most swine infected with hog cholera, cell inclusions of very significant and interesting character have been demonstrated. The presence of these intracellular bodies is not necessarily confined to the animals which show the purulent conjunctivitis often associated with hog cholera. Although the percentage in non-infected animals is very small, (3%, according to Uhlenhuth) in infected animals the inclusions are usually present. As has already been mentioned, the cellular inclusions resemble the so-called chlamydozoa or stryngoplasma present in trachoma of man, and which Noguchi[41] claims to have cultivated *in vitro*. The bodies are readily demonstrated in smear and impression preparations from the conjunctiva of hogs as soon as they become visibly sick. When stained by Guinsa's method they appear as granular masses of a deep purple color inside the cytoplasm of the conjunctival epithelial cells. These bodies occasionally rival in size the nucleus of the cell, but are usually smaller and consist of large numbers of very small, deeply stained granules. As yet the exact significance of these bodies and their relation to hog cholera has not been established.

In addition to the similarity of these bodies to the cell inclusions found in trachoma it is noteworthy that in epithelioma contagiosum and vaccina, similar bodies are present in the proliferating ectodermal cells, while there are certain resemblances to the Negri

bodies in rabies which are present in the nerve tissue of rabid animals. All diseases in which chlamydozoa and similar bodies have been demonstrated are believed to be due to filterable viruses. In none of these have the actual germs of the diseases been positively demonstrated. We are inclined to attribute these cell inclusions to protoplasmic changes due to selective action of the virus for those particular cells. That is in accordance with the evidence from the lesions that the filterable virus of hog cholera has a selective and destructive action for the endothelial and epithelial cells.

Concerning the Virus in Vitro. The time that the specific organisms of hog cholera will live outside their natural host depends upon the effect of the physical and chemical influences to which they are subjected. There is abundant circumstantial evidence that the virus under favorable natural conditions may live for over a year in infected wallows and pig sties. On the other hand, we know that it is quickly destroyed in putrefying material and susceptible animals have been placed in previously infected pens after a lapse of three months without contracting the disease. It is well known that under laboratory conditions, virus may sometimes be kept for months without a diminution in virulence. It frequently occurs, however, that in a few days originally virulent blood will weaken and occasionally even lose its pathogenic power entirely. The cause of this has not been satisfactorily explained. It has been observed that the virus retains its virulence longer in filtered bacteria-free serum than in filtered urine.

The Effect of Temperature. *Heat* is an effective agent for the destruction of hog cholera infection. The virus is relatively more resistant to both moist and dry heat than the vegetative forms of most bacteria, but not so resistant as the spores of anthrax and similar organisms.

The effect of heat on virus is illustrated by the following table prepared from the published experiments of the German Imperial Board of Health Laboratories.[55 56 57]

Material	Temperature degrees centrigrade	Time	Result
Liquid serum filtrate	45	24 hours	Not killed nor weakened
Liquid serum filtrate	46.5	24 hours	Not killed nor weakened
Liquid serum filtrate	46	48 hours	Killed
Liquid serum filtrate	55	24 hours	Killed
Liquid serum filtrate	60	10 hours	Killed
Liquid serum filtrate	58	2 hours	Not killed
Liquid serum filtrate	78	1 hour	Killed
Dried blood	65	2 hours	Not Killed
Dried blood	72	1 hour	Killed
Dried blood	72	½ hour	Killed
Urine	58	1 hour	Killed
Urine	58	40 minutes	Not killed

Cold does not seem to have any effect, although so far as we know no experiments have been made on temperatures below zero Fahrenheit. The spread of the disease usually abates during the extremely cold weather in the northwest central states, but begins again with the spring thaw. In the Imperial Valley, California, relatively few cases of cholera occur during the three hottest months when the temperature ranges from 70 to 115°F., but losses begin to increase with the advent of cool weather.

Drying at a temperature of 37°C. does not impair the potency

Sunlight seems to have very little effect even by direct action. Virulent serum filtrate exposed 9 hours to direct sunlight remained fully virulent to experimental animals.

Putrefaction. The virus is known to be relatively sensitive to the effects of putrefactive organisms. Carefully controlled experiments have proven that the virus is destroyed in decomposing meat in a few days. The virus in old putrefied organs loses its virulence in eight days. Giltner reports, however, the persistence of virus in putrid pork for one year. Virus containing urine to which hog manure was added to hasten decay, lost its virulence in 24 hours when kept at a temperature of 22°C. Virulent filtered serum, when mixed with non-sterile blood and urine, lost its disease producing power in 5 days. The same virus filtered twice and kept sterile at room temperature was still fully virulent at the end of five days. Virulent blood preserved with 0.5% to 1% carbolic acid often retains its virulence for several weeks while the same blood without preservative loses its virulence as soon as it begins to de-

compose. The fact that the virus will persist longer in diluted filtered serum than in decomposing blood may explain why contaminated water is such a frequent source of infection, for it would appear that the virus will survive more readily in water than in decomposing organic matter.

Disinfectants. On account of the resistance of the virus to chemicals it would seem that dependence should not be placed on the use of disinfectants in the dilutions which are usually used to kill pathogenic bacteria. Even when the 3% solution of lysol or compound solution of cresol is used, as recommended by the Bureau of Animal Industry, it should be borne in mind that an application for over 1 hour is necessary to kill the virus. Müller[40] states that even in pens built of iron and concrete the destruction of the virus is so difficult that after the disinfection of infected pens, immediate restocking with susceptible swine is usually followed by losses from hog cholera.

It is recommended that the application of 6 per cent. cresol soap solution or calcium chloride be used to disinfect pig sties.

The following table compiled from the results of experiments published by the German Imperial Board of Health Laboratories[55] [56] [57] shows the resisting power of hog cholera virus to disinfectants. As a rule the tests were made by mixing 10 c. c. of virus with an equal amount of aqueous dilution of the disinfectant.

Bacteria Associated with Hog Cholera Infection. Infection with the virus of hog cholera is usually followed by the invasion of the tissues with certain species of bacteria. The presence of these bacteria greatly complicates the problems of the investigator who attempts to explain the pathological changes which occur in hog cholera. Some authorities hold that several species of bacteria which are frequently associated with hog cholera are occasionally the cause of epidemic disease in swine without the presence of a filterable virus. This belief, however, appears to be losing ground in the United States, although it is still generally held that *B. suipestifer**, *B. suisepticus* and possibly other organisms are the occasional cause of sporadic disease.

Bacteria of the Colon Typhoid Groups*. The *Bacillus suipestifer (B cholera suis)* first described in 1885 by Salmon and

* For description of the morphological and biochemic characteristics of these bacteria, the reader should consult any complete veterinary bacteriology,—only the important points relating to their association with hog cholera virus are mentioned here.

Table Showing the Effect of Disinfectants on Hog Cholera Virus

Disinfectant	Dilution Applied	RESULT
Corrosive sublimate	0.3% solution	Serum filtrate virus not killed in 8 days.
Corrosive sublimate	0.5% solution	Serum filtrate virus not killed in 4 days.
Corrosive sublimate	0.2% solution	Urine virus killed in 15 minutes in one instance, but in another instance mixture was still virulent.
Carbolic acid	0.5% solution	Serum filtrate died in 8 weeks and in one instance after 12 days. Fails to kill in 8 days.
Carbolic acid	1.0% solution	Failed to kill serum virus filtrate in 4 days.
Carbolic acid	3.0% solution	Failed to kill virus blood in 8 days.
Carbolic acid	2.5% solution	Failed to kill virus in urine in 15 minutes.
Chloroform	Full strength	Serum filtrate virus not killed in 24 hours.
Sodium taurocholate		Defibrinated blood virus not killed in 4 days.
Formaldehyde	2.5% solution	Serum filtrate virus still potent after one hour, but killed in 15 days.
Urea	20.0% solution	Failed to kill serum filtrate virus in one month.
Iodine (Lugol's Sol.)	0.25% solution	Failed to kill serum filtrate in two hours.
Glycerine	33.0% solution	Failed to kill serum filtrate virus in one month.
Ozone (Generated in	Stemen's apparatus)	Defibrinated blood virus not killed.
Hydrogen Peroxide	10.0% solution	Serum virus not killed in two hours.
Wittol	2.5% solution	Killed serum virus in 30 minutes. } Results with Wittol inconclusive on account
Wittol	0.5% solution	Killed serum virus in one hour. } of infiltration at points of injection.
Antiformin	1.0% solution	Serum filtrate virus not killed in 24 hours.
Antiformin	2.0% solution	Virus in urine not killed in 10 minutes but killed in 15 minutes.
Antiformin	2.5% solution	Serum filtrate virus killed in two hours.
		Defibrinated blood not killed in two hours.
Antiformin	5.0% solution	Serum filtrate virus killed in one hour.
Sodium bicarbonate	3.0% solution	Virus not killed in 2 hours at 37°C.
Soap	3.0% solution	Virus had no effect after two hour at 37°C. Results inconclusive on account of infiltration at point of injection.
Milk of Lime	Equal parts of milk of lime and virus serum	Failed in some instances to kill virus in one hour.
		In other experiments the serum virus was killed in 20 minutes.
		In urine the virus was killed in 15 minutes.
Chloride of Lime	5.0% solution	Serum virus killed in 1¼ hours.
Lysol	3.0% solution	Serum virus filtrate in some experiments was killed in one hour.
		In two instances the virus was still potent after one hour.
Cresol soap solution	3 to 6% solution	Always killed the virus in one hour.
Cresol soap solution	3 to 4% solution	Serum filtrate virus weakened but not killed in ½ hour.
Cresol soap solution	3.0% solution	Killed virus in urine in ¼ hour.
Pyocyanase	Equal parts of pyocyanase and serum virus mixed	Was still virulent after four hours.

Smith was for many years believed to be the specific cause of hog cholera. The view at present seems to be that this organism is responsible for certain lesions in pigs, but that it is not the cause of epizootic hog cholera. Authorities differ as to the importance which they attribute to this organism as a cause of disease in swine. The organism is frequently present in the circulating blood of swine infected with the filterable virus of hog cholera, but in many cases it has been found impossible to demonstrate its presence.[4 57] *Bacillus suipestifer* and similar strains have been isolated from the intestines of healthy swine in herds where no epidemic existed. It should be noted, however, that when such strains have been tested as to their pathogenic power, when given by the mouth to pigs the results have been negative.[57]

It has been demonstrated that *B. suipestifer* when fed or when injected intravenously may produce a diseased condition indistinguishable from hog cholera except by the absence of the filterable virus and the lack of transmissibility by association. Under certain conditions it is probable that these organisms may become enhanced in virulence or the resistance of the animal may be reduced and infection result even when the infection with filterable virus is absent. Contrary to the infection produced by the filterable virus hogs, which are infected with pure cultures of the *Bacillus suipestifer* do not transmit the disease to healthy hogs and if they recover they continue to be susceptible to natural infection.[12] By feeding quantities of cultures, inflammatory and necrotic processes develop on the mucous membranes and sometimes congestion and caseation of lymph glands. Subscutaneous injections are not so liable to be fatal.

Bacillus typhi suis and Bacillus voldagsen. In Germany considerable pathogenic importance is attributed to certain strains of the Paratyphoid B. group, particularly *B. typhi suis* which has been isolated from young swine showing lesions of caseous enteritis.[8 14 45 58] The advocates of the claim that this particular organism is of great pathogenic significance and the specific cause of a pig typhoid apart from its association with true hog cholera have been unable to convince all of their colleagues.[9 20] Some leading German authorities assert that these organisms are fundamentally only a variety of *B. suipestifer*.[29] The recent isolation of *B. typhi suis* from the mouths of sound pigs in healthy herds as a further victory for those who have consistently held that the filterable virus of

hog cholera is at the root of so-called pig typhoid infections.[33] Lesions resembling those described as found in *voldagsen* and *typhi suis* infections have been found in pigs in California. In one instance a herd of several thousand hogs has been under observation by Hayes for a year, during which time several hundred pigs of weaning age have become so affected. No evidence of cholera in any form was established even though many autopsies have been held and infection experiments carried out. The symptoms in these pigs might easily be mistaken for hog cholera. Traum has isolated *B. suipestifer* but efforts to find *B. typhi suis* have thus far failed. The predisposing causes in this outbreak of diphtheritic caseous enteritis are attributed to congenital weakness and malnutrition.

Bacillus Coli Communis. A variety of strains of this well known saprophytic and semipathogenic inhabitant of the intestinal tract have been isolated from the circulation of swine infected with hog cholera.

No one questions its pathogenic significance as a secondary invader or that its presence like that of its cousin *B. suipestifer* may increase the malignancy of the disease so far as the particular individual infected is concerned.

Bacillus suisepticus (Bacterium suisepticum, Bacillus of swine plague). In those cases of hog cholera having pulmonary lesions this organism is especially liable to be present. It has been repeatedly demonstrated in the air passages of healthy swine and until the discovery of the filterable hog cholera virus was considered to be the primary cause of swine plague. It is the concensus of opinion in America at the present time that the majority of outbreaks of so-called swine plague are primarily due to the hog cholera virus, the *Bacillus suisepticus* being a secondary invader. In fact it has been demonstrated that the presence of this particular species of bacteria is not essential to the development of advanced lung lesions in hog cholera. The filterable virus alone probably never produces extensive hepatization or purulent inflammation in the tissues, but when associated with *Bacterium pyogenes suis* or other semipathogenic bacteria present in the open passages as well as with *Bacillus suisepticus*, may cause pneumonia. The virulence of various strains of this bipolar bacillus varies within very wide limits and changes very rapidly even in cultures of the same strain. It is possible that extensive outbreaks of pure swine plague

do occur, although so far as we know this has never been positively demonstrated by filtration experiments. The writer has observed one instance of epidemic pneumonia in some large herds of swine in which anti-hog-cholera serum failed, but which later yielded to sanitary and isolation measures. In Germany pure swine plague (Schweineseuche) is still considered an important disease often distinct from hog cholera.

SPIROCHAETA HYOS (SPIROCHAETA SUIS) an organism found in the intestinal ulcers, crypts in the ceca, and external local lesions of animals infected with hog cholera is believed by King to be more nearly established as the specific cause of hog cholera than any other known organism.[30 31 32] He reports having cultivated this organism in pure culture. This spirochaete appears to be capable of breaking up into granules which have the power of passing through bacteria-proof filters. The organism including the granular forms which pass through the filters are capable of producing sickness tpyical of hog cholera. The spirochaetes, however, being demonstrable only in the intestinal or local external lesions. Until more data is available the question of the relation of spirochaetes to hog cholera remains open.

The fact that sodium taurocholate quickly destroys most spirochaetes, but has no effect in the filterable virus of hog cholera, is presumptive evidence that *Spirochaeta suis* is not the specific cause of hog cholera.[39]

BACILLUS NECROPHORUS. This organism is frequently the primary cause of serious necrotic inflammations in swine, particularly in suckling pigs, in which it causes skin infections and sores in the mouth. The filterable virus of hog cholera produces favorable conditions in the tissues for the development of this species of infection. *B. necrophorus* has been demonstrated in button ulcers which at one time were thought to be especially typical of hog cholera.[1]

OTHER BACTERIA. The presence of bacteria of various kinds in the lesions and circulation of virus infected hogs should be considered as a natural result of the injury to the tissues, particularly the endothelial cells by the virus, furnishing portals of entry for all kinds of bacteria which, on account of the lowered resisting power of the body, may spread in the tissues and circulation. In affected hogs Uhlenhuth found *B. suipestifer* in 76 cases, *B. paratyphoid A* in 3 cases, *B. enteritidis* (Gaertner) in 1 case, *B. pyocyaneus* in 50 cases, streptococci in 36 cases, staphylococci in 27 cases and *B. coli* in 110 cases. In 14 cases the organs were sterile.

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THE CONTROL OF HOG CHOLERA

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An outline of the definite measures which should be taken to prevent hog cholera is given in the section of this committee's report on prevention. It remains, however, to mention the forces available for aid in this work and describe the schemes of organization by which these measures may be executed.

It is evident of course that no progress can be made in the exceedingly difficult task of enforcing a preventive measure without an intelligent public interest, confidence and support. Therefore, organized efforts along educational lines are the first steps to be considered. The following resolutions adopted at a conference of federal and state officials in Chicago on March 3d, 1914, express the concensus of opinion of our committee:

"We regard Hog Cholera as one of the greatest questions be fore the public at this time. The disease has been prevalent many years, with losses fluctuating between wide limits. The heaviest losses, as shown by the best available data, were 120 and 130 hogs per thousand in 1887 and 1897, respectively. The estimates for 1913 are 100 loss per thousand, and the indications are that the disease is passing through another period of rapid increase. In view of the high cost of living, such enormous losses of a valued food product must be regarded as a calamity.

"The main problem at this time is to control the disease. With progress now being made, both in science and practice, it may be expected that the question of eradication will come up later; but, unquestionably, the matter of control will be uppermost for years to come.

"For success, the first requirement is an honest and earnest purpose to co-operate as between all the interests involved, especially the scientist, the veterinary profession, farmers, common carriers, and packing interests.

"The control and final eradication of hog cholera will depend largely upon the education of farmers to the importance of observing sanitary principles.

"The serum alone treatment may be given by anyone without danger of causing cholera. Such harm as follows this treatment is due mostly to ignorance in the use of serum or of sanitation. While it is preferable to have serum used only by competent veterinarians, it is not deemed advisable to require that layman may not use serum alone.

"The closest possible supervision of the manufacture and distribution of serum should be provided, to assure its purity and potency. It is believed that this should be in charge of federal authorities in such plants as may properly come under their supervision, and provision should be made in the different states to duplicate and supplement the federal efforts along this line.

"It is desirable for the states to manufacture serum, but neither by the size of the plant nor by the price of the product, should this effort be monopolized by the states.

"The simultaneous treatment should be used only by those who have had special training. The ideal arrangement would be to allow its use only by federal and state veterinary officers. Other officers who have sufficient training in the use of virus, and in sanitation, may use the simultaneous treatment with safety. Where it is not possible to restrict virus to official hands because of shortage of funds or lack of officers, or for other uncontrollable reason, it should then be used only by such other persons as have been given a special permit after receiving special instruction, which is as thorough and detailed as feasible, and who show that they understand the essential fundamental principles. But in any such case, the unofficial layman should be permitted to use virus only in his own herd, and then only if the district is already infected.

"The manufacture, distribution and use of virus should be rigidly supervised by federal and state authorities.

"Quarantine and sanitary measures should be much more actively emphasized and enforced. Especially, it is important that freight cars which have carried infected stock shall be promptly disinfected after unloading, and infected premises should be rigidly quarantined.

"The prevailing practice of rushing sick herds to market should be discouraged in every way possible, and in lieu of such disposal

of sick herds, the owners and other persons concerned should be advised and encouraged to treat them with anti-hog-cholera serum.

"The promulgation and enforcement of all live stock sanitary regulations and other measures incident to quarantine should remain invested in the live stock sanitary boards and state veterinarians of the various states.

"Progress in combating hog cholera is being made. Special credit is due to individual efforts on the part of veterinarians and farmers. The intelligent interest of county agricultural agents is commended, and it is believed that these agents should give chief attention to assisting farmers to secure the aid of competent veterinarians, and when that is not possible, they should assist the farmers themselves to take proper remedial measures always emphasizing the importance of sanitation. There is recommended the temporary assignment of a competent veterinarian by the state government, independently or in co-operation with the federal government, to any district where difficulties on account of hog cholera are most acute, his services to be available to farmers without cost, for the purpose of demonstrating the best methods in different communities.

"Work of the highest character is being done by the United States Bureau of Animal Industry, which Bureau brought out the serum treatment for hog cholera, a treatment which has been adopted in most states and countries where the disease exists. We acknowledge with appreciation the action of Congress, whereby far more liberal provision than ever before has been made to investigate and combat the ravages of hog cholera. Similar provision has been made in several states, but the legislatures are urged to make more liberal appropriations of this character.

"There should be the closest co-operation between state and federal authorities, and all persons concerned should be willing to suppress their own opinions on relatively unimportant matters, and follow the lead of federal authorities in the interest of the adoption of uniform methods throughout the entire country."

The following policy of the U. S. Department of Agriculture in regard to handling their hog cholera work was adopted in March, 1914:

MEMORANDUM

POLICY IN REGARD TO HANDLING THE HOG CHOLERA WORK UNDER THE ACT APPROVED FEBRUARY 23, 1914.

1st. There will be established three major projects, as follows:

(a) Experiment to demonstrate the practicability of eradicating hog cholera from selected sections of the country.

A definite area (one county) will be selected in each of about fifteen states. An attempt will be made to control or eradicate hog cholera from these areas. The Department of Agriculture will place qualified inspectors with assistants in these areas and will furnish the serum required for the work. The states will be expected to co-operate by carrying on the needed educational work and survey, and by enforcing the necessary quarantine and sanitary regulations.

(b) Supervision of private, and, where necessary, state serum plants, so as to protect farmers against the use of spurious and dangerous serums.

This project will be carried out entirely by the Department of Agriculture, and will consist in inspection of serum and virus plants doing business, the issuance of licenses to qualified establishments, the supervision of serum production in licensed establishments, the examination and testing of samples of serum and virus shipped interstate or offered for importation, and the collection of evidence bearing upon violations of the law under which this project is established.

(c) Demonstrational and educational work among farmers in co-operation with the states in order to bring about a better understanding of the disease and approved methods of combating it.

This, as the name indicates, is a demonstrational project and will be conducted along lines similar to those developed by the Bureau of Plant Industry in its farm demonstration and county advisory work; the organization of clubs for educational, demonstrational and other work in the prevention of hog cholera, co-operating with the Division of Animal Husbandry, the Farmers' Co-operative Demonstration Work, and the Office of Farm Management in their field; the utilization of county advisers and farm demonstrators in educational and propaganda work in methods of preventing hog cholera through sanitary and quarantine measures and the use of serum. The fundamental idea to be carried out in this project is to demonstrate to farmers how they may, by their own effort, reduce losses from hog cholera.

2nd. The President or Dean of the Agricultural College within the State, the Commissioner of Agriculture of the State, the State Live Stock Sanitary Board, or other recognized authority charged with the administration of hog cholera work within the state, is to

be recognized as the agency through which all co-operative work will be handled. The co-operating state authority, as indicated above, is to act as a clearing house for all organizations co-operating with the Department of Agriculture under project. This plan is adopted merely to simplify and facilitate co-operation for it seems desirable, if not essential, for the Department of Agriculture to deal with one particular authority whose function will be to bring into harmonious accord the various state organizations engaged in the co-operative work. This plan is in conformity with the principle laid down in the Lever Bill which has jast passed both houses of Congress and which has met with wide-spread approval everywhere.

3rd. The President or Dean of the Agricultural College within the State, the the Commissioner of Agriculture of the State, the State Live Stock Sanitary Board, or other recognized authority charged with the administration of hog cholera work within the state, will select the county or counties in the respective states where the work is to be done under project (a) with the understanding that the selections are to be approved by the Secretary of Agriculture. This is the procedure now followed in the selection of county advisers and is believed to be necessary. The localities in which the work under project (c) is to be carried on will be selected in the same manner.

The following Constitution and By-Laws for County Organization express our ideas on local organization:

Constitution and By-Laws of the Farm Bureau Swine Breeders' Association.

Preamble.

In order to promote swine husbandry in.....county, co-operation in marketing swine and assisting in the control and final eradication of hog cholera, and to encourage the raising of greater numbers of superior grades of swine, we, the undersigned, do, under the auspices of the.....County Farm Bureau, form a permanent association with the following Constitution and By-Laws:

Article I. Name.

The name of this organization shall be the .....Farm Bureau Swine Breeders' Association. It shall be abbreviated as follows: F. B. Swine Breeders' Association.

Article II. Object.

The object of the association shall be to promote the swine raising industry, to co-operate with the U. S. Department of Agri-

culture, the local authorities, state authorities and the University of California, and members of this association in the control and final eradication of hog cholera in this county, the ethics of the association and prosecution of violators of any county ordinance or state law enacted for the protection of hogs against disease, and to promote co-operative buying and marketing in connection with the swine industry.

ARTICLE III. MEMBERSHIP.

Any member of the.....County Farm Bureau owning or interested in swine, or pork production, may become a member of this association by agreeing to the constitution, signing a membership card and by paying an annual membership fee of one dollar, and such other dues as may be regularly assessed.

MEMBERSHIP CARD

.....Farm Bureau Swine Breeders' Association.

I do hereby agree to work in co-operation with the..... County Farm Bureau and the officers of this association to promote swine industry and to prevent the spread of hog cholera.

I will obey all rules and regulations prescribed by the organization and co-operate with the work in every way possible.

I hereby agree to notify the County Live Stock Inspector and Farm Adviser, and through them the State Veterinarian, and if any of my hogs are sick from any cause, whether known to me, or unknown, and if I hear of my neighbor's swine being affected with any disease, I will report at once to the County Live Stock Inspector and the Farm Adviser.

Should I ship any swine into.....County I will abide by the local ordinance in relation to movements of swine.

Signed.....

ARTICLE IV. OFFICERS AND DUTIES.

Sec. 1. The administration of the affairs of this association shall be vested in the following officers: A President, Vice-President and Secretary-Treasurer, and Executive Committee of five members. The President and Secretary shall be ex-officio members of the Executive Committee and shall constitute two of the five members.

Sec. 2. The term of office for all officers shall be for one year.

Sec. 3. All officers shall be elected at the regular annual meeting, except the executive committee, which shall be appointed by the president.

Sec. 4. At all elections a majority of votes shall be necessary to elect. Votes shall be taken by ballot.

Sec. 5. Each officer shall be entitled to one vote.

Sec. 6. The President shall preside at all meetings of the association, appoint all standing committees and perform all other duties not otherwise specified.

Sec. 7. The Vice-President shall perform the duties of the President in his absence.

Sec. 8. The Executive Committee shall within two weeks after the election appoint the members of the Board of Control and allot to each member appointed a district of which said member is a res'dent.

Sec. 9. It shall be the duty of each and every member of the Board of Control to be familiar with all conditions existing within their respective districts, and to report the same to the County Farm Adviser once every month, or as much oftener as a new outbreak of cholera occurs.

Sec. 10. The time and place of holding the annual meeting of this association shall be permanently fixed by the members of the executive committee.

Article V. Vacancies.

The officers shall have the power to fill all vacancies.

Article VI. Meetings.

Sec. 1. The association shall hold a regular annual meeting during the Spring, the date and place to be set by the officers and announced at least two weeks prior to the time of meeting.

Sec. 2. The officers shall hold a monthly meeting in the office of the Farm Adviser, or (Sec. 2) the officers shall meet on call of the president.

Sec. 3. It shall be the duty of the president to call special meetings of the association at the request of a majority of the officers, and notice of same shall be given in advance.

Sec. 4. Special meetings may be called at any time and place within the county of .....by the president and secretary, or by three members of the executive committee.

Sec. 5. Business of any nature relating to the promotion of the plans and purposes of the association may be transacted at any meeting of the association, either annual or special, except the election of officers.

Article VII. Committees.

The committees shall be appointed by the executive committee. The number of committees and number of persons on each committee to be regulated by the character of the work to be done. Committeemen shall serve for a term of one year, or for a length of time specified at the time of their appointment. Their duties shall be outlined at the time of their appointment. The Farm Adviser shall be ex-officio on all committees.

Article VIII. Amendments.

This constitution may be amended by a two-thirds vote of the members present at any regular or special meeting. Notice of such amendment must be given at least two weeks in advance.

Article IX. Order of Business.

The following shall be the order of business at all regular meetings of the association and officers:

1. Call to order by the president.
2. Reading of minutes of previous meeting.
3. Report of committees.
4. Unfinished business.
5. New business.
6. Adjournment.

Article X. Exacting Clause.

Sec. 1. This constitution shall be in effect on and after its adoption.

Sec. 2. All officers elected at the time this constitution is adopted shall hold office only until the next annual meeting.

By-Laws.

1. A member shall be considered to have been properly notified of any proposed action of the association, by its officers, whenever such notice shall have been mailed to each member, or published in two issues of such county papers as may be designated by the officers.

Code of Ethics.

Sec. 1. Members of this association are expected to cooperate with the County Live Stock Inspector, County Farm Adviser and the State Veterinarian, in efforts to control and eradicate cholera as well as other diseases among swine in .....County.

Sec. 2. Every member of this association whenever sickness occurs in his swine which appears to be infectious in nature, shall immediately notify the County Live Stock Inspector, County Farm Adviser and the State Veterinarian of the existence thereof.

Sec. 3. No member of this association shall allow a carcass of any hog which dies to remain upon the ground, but he shall immediately dispose of such carcass by cremation, if possible; otherwise, by burial in quick lime.

Sec. 4. Whenever cholera appears among hogs of a member of this association he shall have his swine treated with anti-hog-cholera serum and also thoroughly clean and disinfect all infected yards, pens, etc., with a disinfectant of recognized strength, in order to prevent the spread of the disease. He will also allow a placard to be tacked on a prominent place on the fence adjacent to the entrance of his premises; such placard shall state in plain language that cholera exists among hogs on these premises, and shall warn all people to keep away from the hog pens thereof.

Sec. 5. Every member of this association shall prohibit strangers, and especially vendors of patent hog remedies, from visiting his pens.

Sec. 6. Every member of this association, whenever cholera exists among his hogs, shall refrain from visiting the hog pens of other swine raisers in.....county, and shall also clean and disinfect his hands and change his clothing and shoes after handling his infected hogs and visiting the infected pens, before he holds any intercourse with any other swine raised in.....County

Sec. 7. Whenever it has been determined that cholera exists among the hogs of any resident of.....County, the president of this association shall urge all swine breeders who are raising hogs in the vicinity of such outbreak, to allow all such hogs to be immunized with anti-hog-cholera serum.

Sec. 8. Every member of this association shall have displayed in a prominent place on a fence near the entrance of his premises, a stenciled sign reading as follows: "Member of.....County Swine Breeders' Association—no visitors allowed in hog pens without permission."

Sec. 9. Every member of this association agrees to see that the rules of the association and its code of ethics, as well as the laws of the county of.....and State of.....concerning the eradication of hog cholera, are properly complied with by his neighbors, and each member further agrees that when violations of these rules, code of ethics and laws come under his observation, he will immediately notify the member of the executive committee who lives in his district, as well as the president of the association, and also, if necessary, the State Veterinarian.

Sec. 10. As hogs which are vaccinated by the sero-simultaneous method for producing immunity against hog cholera are, in many instances capable of transmitting cholera to non-immunized hogs, every member of this association agrees, whenever his hogs are so vaccinated, that he will permit his premises to be placarded as follows: "HOGS ON THESE PREMISES HAVE BEEN VACCINATED WITH VIRUS AND SERA: NO VISITORS ARE ALLOWED IN THESE HOG PENS."

Such a member shall also handle his hogs and prevent the extension of hog cholera infection, as provided for in Section 6 of this article.

Sec. 11. The members of this association agree, wherever possible to remove their hog pens from portions of their ranches that abut on public roads.

Sec. 12. Every member of this association agrees that whenever new hogs are purchased from outside of.....County, that they shall be placed by themselves for a period of at least thirty days before being turned in with the other hogs.

DISSEMINATION AND PREVENTION

A. T. KINSLEY, Kansas City, Mo.

DISSEMINATION. The original source of the virus of hog cholera like the origin of other viruses and pathogenic agents is unknown. The following are the principal sources of virus of hog cholera: infected swine, the discharges from infected swine, the carcasses of swine dead of cholera, virus used in simultaneous immunization of swine; food, water, vehicles of transportation, stock yards, and any other substance, object or animal contaminated with the discharges of infected swine, or the tissue juices or products of the carcasses of swine dead of cholera.

From the foregoing the ease of dissemination of infection is readily comprehended. The virus is transmitted from an infected swine on non-infected premises to other swine, soil, food, water, and bedding, thus practically insuring infection of the surroundings and of other swine on the same premises. Serious outbreaks of cholera are sometimes traceable to the introduction of a boar or other animal that is infected. If the carcasses of swine dead of cholera are permitted to remain in the hog lot other swine will become infected by eating of the infected flesh and the soil and surroundings will also become contaminated with the virus. (Some men have shown their faith in the protection of swine against cholera with serum by putting the carcasses of swine dead of cholera in their pens and thus infecting the premises).

From the lack of care in the use of virus in simultaneous immunization, there is little doubt but hundreds of farms have become infected.

Food hauled in wagons or other vehicles that have been previously used in transporting cholera infected swine may become contaminated and infect healthy, susceptible swine and thus produce hog cholera.

Water is frequently the source of infection. This is especially noticeable in the spread of hog cholera in sections of country in which there are many small streams. Such enzootics usually follow the streams. The contamination of surface water is due to the discharges and even the carcasses of cholera infected hogs being washed into small streams. Many hog raisers have fenced and made pastures of the low lands and the small streams of water, thus increasing the possibility of infection.

Most every state in the union and many foreign countries permit the shipment of cholera infected swine to market centers. By this means stock yards, stock cars, and the railroad right of way becomes contaminated with the discharges of cholera infected swine and the chances are that some of the discharges contain the virus of hog cholera in sufficiently virulent form to produce cholera in healthy, susceptible swine. By this means, cholera is, no doubt, frequently transported hundreds of miles and new centers established. As yet few if any states actually require the cleaning and disinfecting of cars that have been known to have been used to transport cholera infected hogs to the market, and therefore, the cars continue as a source of infection for some time after the cholera infected hogs have been unloaded. By the practice of shipping cholera hogs to market, practically all public stock yards become infected and are therefore a source of danger in the community. The cholera infected swine are hauled or driven from the farm to the railroad station along or over the public road which thus becomes a source of infection, the virus of which may collect upon the feet of horses, wheels of wagons or other vehicles and be transported to farms where infection had not been present.

The possibility of virus carriers of hog cholera infection must be admitted, for such carriers and distributors of infection occur in other infective diseases. It has been claimed by good authorities that swine immunized simultaneously do not eliminate the virus but this claim has not been satisfactorily proven. Because of the possibility of simultaneously immunized swine eliminating infection, they must be considered a source of infection.

Dogs, crows, buzzards and pigeons are scavangers and are an important factor in the dissemination of infection. Visiting back and forth and exchanging labor are prolific means of carrying infection from place to place. Careless veterinarians have in some instances apparently been responsible for the transmission of hog cholera from infected to non-infected premises.

Garbage containing scraps of pork has been a means of disseminating hog cholera virus.

PREVENTION. It is probable that more proprietary remedies have been devised and advertised as hog cholera cures than for any other disease of domesticated animals. The application of therapeutic agents, other than anti-hog-cholera serum, has not proven satisfactory in any proven outbreak of cholera.

With this disease as with any other, prevention is far better than treatment. This is a preventable disease but unfortunately it has been responsible for extensive losses of swine for so many years in practically every country, that the swine breeders and raisers have apparently become accustomed to the losses and accept it as a matter of fact and until recently, with little concern as to methods of prevention. The prevention of hog cholera may be accomplished by complying with the laws of hygiene, the enforcement of sanitary police regulations, and by immunization of swine by the use of anti-hog-cholera serum.

The laws of hygiene of other domesticated animals than the swine are fairly well provided for by the stock raisers. It has been the custom and it is far too common at the present writing to consider that anything is good enough for swine. Thus, many men having extensive financial interests in pork production are constantly seeking fermented grain, moldy and otherwise spoiled or damaged foods for their swine, because such food stuff can usually be purchased for less money than a clean, wholesome food. Such foods interfere with the digestion, thus weakening the animals and rendering them more susceptible to disease. Swine that are given the proper diet are not necessarily immune to cholera but they are much more resistant than swine affected with digestive derangements. Swine should also receive an abundance of clean, wholesome water and not be required to drink water from polluted streams or stagnant pools. Many cases of what would probably have been fatal cases of cholera have been nursed back to health by providing good surroundings and a liquid diet, consisting of sweet milk from a cow.

Hog pens should not be placed, as they frequently are, in locations where they cannot be properly drained. It is not necessary for swine to have mud and filth for their existence, they will thrive better when kept in sanitary quarters.

Sanitary police regulations or general sanitation in relation to control of hog cholera has certainly not received the proper consideration. If rules and regulations were instituted prohibiting the dissemination of hog cholera, the losses could be rapidly diminished. The following provision for quarantine and shipping regulations were recommended by the committee on uniform methods for the control of hog cholera at the meeting of the United States Live Stock Association in December, 1913:

1. The shipment or movement, interstate, of swine affected with hog cholera to be prohibited.

2. Exposed swine to be shipped under permit and placarded.

3. The movement of cholera infected swine over the public highways of the state to be prohibited.

4. Provision for moving exposed swine under permit in approved manner.

5. Carcasses of animals, and particularly of swine that have died of cholera, to be burned within twenty-four hours after death, or under special permit to be disposed of otherwise.

6. The shipment by rail of swine for purposes other than immediate slaughter to be permitted only through special pens and unloading chutes or through portable chutes directly into wagons. If unloaded in regular loading pens, to be moved under permit in approved manner.

7. Public stock yards to be under close supervision and cleaned and disinfected at intervals determined by the proper state authorities.

8. Railway cars for the transportation of swine other than such as are intended for immediate slaughter to be cleaned, washed and disinfected before swine are loaded.

9. All cars in which diseased swine are found, or in which exposed swine were shipped for immediate slaughter, to be cleaned, washed and disinfected within twenty-four hours after unloading, or cars to be held until the presence or absence of diseases has been determined.

10. All cars or vehicles of transportation carrying cholera exposed swine to be placarded in a conspicuous manner, "Cholera Exposed Swine for Immediate Slaughter".

11. Owners of swine and persons in charge, including attending veterinarians, to report without delay to state authorities all outbreaks of cholera among swine.

12. Live stock sanitary authorities to quarantine all infected herds and premises, but may permit shipment of exposed swine for immediate slaughter as above provided.

13. Infected premises to be quarantined not less than sixty days after last traces of disease have disappeared and premises have been cleaned and disinfected.

14. Infected premises to be cleaned and disinfected under supervision prescribed by live stock sanitary authorities.

(Continued in the next issue.)

MRS. LIAUTARD

As we are going to press, news reaches us of the death of Mrs. Liautard at the age of seventy-five years. She had been an invalid for many years and had received untiring care and devotion throughout this trying period from Dr. Liautard. It has been her illness and his unwillingness to leave her side, lest she should slip away from him during his absence, that has kept him away so long from America, where so much of his life's work has been accomplished.

Only trouble of this character could have kept Dr. Liautard from attending the fiftieth anniversary of the A. V. M. A., which was planned in his honor and of which he would have been and was—even in his absence—the central figure.

Mrs. Liautard was a former resident of New York. Her delicate health was unequal to the vicissitudes of a sea voyage, because of the seasickness to which she was subject. Dr. Liautard did not hesitate to lay aside his own ambition and forego the honor prepared for him in order to consecrate himself to her welfare. To him it was less of a sacrifice than it would have been to many others, less noble in character, to accept the duties laid upon him and devote himself tenderly to her care. Our sympathies go out to Dr. Liautard in this period of deep affliction.

NECROLOGY

DR. JAMES S. ELLIOTT

The death of Dr. James S. Elliott of Clinton, N. Y., occurred October 12, at a Utica hospital. The cause of his death was an attack of Bright's disease from which he suffered a little over two weeks. Dr. Elliott was born in Cumberland, England in 1864. He came to America in 1884 and graduated from the Toronto Veterinary College with the class of 1892. His practice in Clinton began in 1894, where his skill and services were much esteemed, both as a veterinarian and a public-spirited citizen. For the past three years he was officially connected with the State Agricultural Department where his services were much appreciated. Dr. Elliott is survived by a wife and four children.

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DONALD McINTOSH

Dr. Donald McIntosh, professor of Veterinary Science at the University of Illinois, Urbana, died on September 5, at his summer home in Portland, Me. He lacked but a few months of serving the university for thirty years continuously, and thousands of students are willing witnesses to the helpfulness and reliability of his instruction. He lived for his work and worked to the last; only five days before his death he had retired from active service on a university pension. Dr. McIntosh went to the University of Illinois as special lecturer and in June, 1886, was elected to his permanent position. He arrived at a time when the university possessed but three buildings for instructional purposes and the student attendance was but 332.—*Breeders' Gazette.*

COMMUNICATIONS

Editor, Journal of the American Veterinary Medical Association,
Ithaca, N. Y.,

Dear Sir:

A recent case of anthrax in man in a New York Hospital was given unusual publicity by the daily press. This was primarily due to the great respect which the patient enjoyed in his community, and also to the extraordinary courage he manifested during the course of his horrible affliction.

My stenographer happened to be in New York at the time, and reading of the case, he lost no time in communicating with the attending physicians, calling their attention to an anthrax serum which has been prepared by me and which has been extensively tested, for boths its prophylactic and curative value.

The stenographer had this information from taking dictation from me while I was preparing a paper on the subject for the American Veterinary Medical Association's meeting at Oakland, and also from notes which he transcribed for me in connection with the work during the progress of the experiments.

Upon telegraphic request the serum was forwarded to New York, and was repeatedly administered to the patient with apparently good results. From the reports of the attending physicians the infection had subsided, but as a result of extreme heart weakness he succumbed quite suddenly; his recovery from anthrax being announced in the bulletins sent out by the physicians.

In the meanwhile the daily press heralded the serum as a wonderful discovery, and made many mistatements as to its preparation, application, origin, etc. It is needless for me to explain the difficulty of having scientific matters correctly quoted in the daily press. It was a useless task to have correct data published as to the serum and its preparation. I was placed as a central light in many newspaper dispatches which was rather an embarrassing position, realizing the undeserved credit given to me.

I have undertaken the experimental work in immunization against anthrax with a view of establishing a more satisfactory method of immunization than those which are now employed in this country. The simultaneous method—consisting of an injection of a potent anthrax serum and a carfully standardized spore vaccine—proved very promising and to my mind superior to the Pasteur method. The results of these experiments were embodied in my paper read before the A. V. M. A., in which have also been included the results of field experiments.

During the progress of the work we had occasion to treat a considerable number of affected animals with our serum, and obtained remarkable recoveries in a very high percentage of cases, including some of the most severe types. The stenographer, knowing

of these results, praised the curative qualities of the serum somewhat beyond its known value, which naturally was interpreted by the newspapers as something wonderful.

It is needless for me to state that anthrax serum has been prepared in Europe by many institutions, and that this phase of immunization has been practiced for several years. We have, however, succeeded in concentrating the serum by a method of precipitation and are now endeavoring to prepare the specific proteids of the immune serum in a dry form to insure its keeping qualities and to prevent contamination. Furthermore, the vaccine which is being used in connection with the serum is an accurately standardized spore vaccine, by which it is possible to establish accurately the number of spores given to an animal.

Although I am satisfied that members of the veterinary and medical professions are familiar with the work which has been carried on in the immunization against anthrax, nevertheless I deem it advisable to state my position in the case in order that I may not be misjudged as attempting to claim priority for something which should and is known by all professional men to belong to others.

It might be of interest, however, to state that in the course of the experiments it was necessary for us to obtain anthrax serum for comparative tests, and to our surprise we found that it was not obtainable in this country. We therefore imported a quantity of such serum, and to our further surprise the comparative tests revealed our serum to be at least twice as potent as the one of foreign make, and this may in part explain the splendid curative value of our anthrax serum.

Very truly yours,
A. EICHHORN,
Chief, Pathologival Division.

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REVIEWS

ANIMAL CASTRATION—J. V. LACROIX
SPECIAL CATTLE THERAPY—MART R. STEFFEN
WOUND TREATMENT—MERILLAT, HOARE AND OTHERS

Published by the American Journal of Veterinary Medicine, Chicago, Ill., 1915.

These books form numbers 7, 8, and 9 in the Veterinary Medicine Series edited by Dr. D. M. Campbell.

It may be inferred from Dr. Lacroix's preface that the book on ANIMAL CASTRATION is intended largely for students. Although some of the information relative to restraint and preliminary arrangements is presumably known and used by those in practice, there is much that will appeal to the practitioner as well as to the

student. The book contains 144 pages including 23 ilustrations, of which the most are reproductions from clear photographs showing methods of restraint, the operating field and different stages of operation. The typography is claer and the quality of the illustrations is enhanced by the excellence of the paper.

SPECIAL CATTLE THERAPY is a work of 157 pages and covers quite a wide variety of topics which the practitioner is likely to encounter in his routine practice. We note the absence of any discussion of contagious abortion, a topic of considerable practical importance in many localities and on which many veterinarians would doubtless be glad to get further light. The usefulness of the book might be still further increased if there were a table of contents for convenience of reference. The topics are treated concisely but clearly; the style is informal and interesting and the general effect indicates an extended personal experience by the author. A concise work of this character should appeal to the country practitioner.

WOUND TREATMENT is a book of 186 pages. Besides the well known authors, Merillat and Hoare, whose articles on Treatment of Wounds; Antiseptics, Past and Present, in Wound Treatment; and the Suppression of Hemorrhage, form the body of the book, there are a number of other contributions, by well known veterinarians, pertinent to the subject.

The chapter by Lewis on standardizing disinfectants, while brief, is very good. It explains clearly how to test the strength of a disinfectant and reference is made to the extensive investigations made by Rideal-Walker in England and Anderson and McClintic in the United States Public Health and Marine Hospital Service. Owing to the necessary brevity of the chapter it might have added some value if the exact references were given to the reports forming the basis of the statements made regarding methods of standardizing disinfectants. The following chapter by Lothe and Beach on the bactericidal properties of the antiseptics and disinfectants contains concise and lucid directions for disinfection and the phenol coefficient of a number of common disinfectants is given together with their cost.

Although each article cannot be treated in detail, it is sufficient to say that they are timely, worthy of study, and productive of thought. A number, if not all, of the articles have appeared in Dr.

Campbell's Journal, but as arranged in this convenient form they will doubtless be welcomed by many practitioners.

As to contents and general make-up, the books may safely be said to maintain the standard of the series and be useful to many veterinarians for study and reference.

P. A. F.

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MISCELLANEOUS

The annual meeting of the Hudson Valley Veterinary Medical Association is announced for November 3, at Catskill, N. Y. The subject for discussion is Parturition and its Sequels.

The next meeting of the Minnesota State Veterinary Medical Association will be held at the Merchant's Hotel, St. Paul, Minn., January 12-14, 1916.

The Iowa State Veterinary Association will hold its meeting January 17-19, 1916. The clinic will be held at Ames on the 17th. A special car will convey the members to DesMoines for the remainder of the program.

A record for weight has been established by a calf born near Alliance, Ohio. At the time of birth it balanced the scales at 159 pounds. The mother was a grade shorthorn and the sire was a Holstein bull.

The counties of LaSalle, Bureau and Putnam, Illinois, have been placed in closed quarantine against Foot-and-Mouth Disease by a federal order, effective September 25.

Dr. J. G. Rutherford of Calgary, Alberta, has been appointed on the Dominion Development Committee to inquire into agricultural production, transportation and markets.

According to the views of the State Veterinarian of Wyoming, dourine is being stamped out of that state. Out of 245 stallions tested only three were found to be affected.

Dr. Orrin E. Dyson, State Veterinarian of Illinois is reported ill with typhoid fever, supposed to have been contracted while endeavoring to eradicate Foot-and-Mouth Disease.

A federal order effective October states that the Secretary of Agriculture has revoked the quarantine placed upon the states of Indiana, Michigan and Virginia. The quarantine status of Illinois, New Jersey, New York and Pennsylvania remains unchanged.

In an attempt to prevent the spread of Foot-and-Mouth Disease in McDonough county, Ill., it is reported that all churches, Sunday Schools, picture shows and other meetings have been ordered discontinued. Public schools are excepted.

In an effort to eradicate hog cholera from Harsen's Island, Mich., it has been found desirable to place a quarantine upon dogs.

The stock yards at Rock River, Wyoming, have been placed under quarantine by the State Veterinarian, until the yards are cleaned and disinfected according to government regulations, because cattle shipped from there to South Omaha, Neb., were found to be infected with scab.

Dr. Thomas H. Edwards of the Ninth Cavalry, Douglass, Arizona, has received orders to proceed to Manila for duty in the Philippine Islands.

A horse at North Attleboro, Mass., was electrocuted by coming in contact with surface water charged with electricity, caused by a ground wire attached to an electric light pole.

Veterinary education is receiving proper recognition in Australia. The college at Melbourne University under the direction of Prof. H. A. Woodruff gives two courses of study, one of 4 and one of 4½ years. The college at the University of Sydney, under the direction of Prof. J. D. Stewart provides a thorough 4 year course.

It is reported that 335,793 American horses have been sold to Europe between August 1, 1914, and October 1, 1915, at an average value of $220 per head. Additional costs are: transportation $85, insurance $10, feed $3, and the horse has from four to ten days' service in the battle line to pay for himself.

The Allentown (Pa.) *Call* referring to the Foot-and-Mouth Disease states that the lesson has been a severe and costly one, but it has been worth every cent spent for it in that it has taught the country and the state to be careful. The value of being irreproachably free from disease is coming to be more and more of value.

The Nineteenth Annual Meeting of the U. S. Live Stock Sanitary Association is called for December 1 and 2, at the Hotel LaSalle, Chicago. This meeting will follow just after the conference called by Assistant Secretary of Agriculture Vrooman.

T. B. Harries of Calgary, Canada, Lt. A. V. C., is seeing service with the 22d Divisional Train, somewhere in France.